DOCUMENT RESUME

ED 227 208 CE 032 946

TITLE Basic Hand Tools for Bricklaying and Cement Masonry [and] Basic Hand Tools of the Carpenter.
INSTITUTION Texas A and M Univ., College Station. Vocational Instructional Services.
PUB DATE [82]
NOTE 41p.; For related documents, see CE 032 948.
PUB TYPE Guides - Classroom Use - Materials (For Learner) (051)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Bricklaying; *Building Trades; *Carpentry; *Equipment Utilization; *Hand Tools; *Masonry; Secondary Education; *Trade and Industrial Education; Units of Study

ABSTRACT

Intended for student use, this unit discusses and illustrates the tools used in brick and masonry and carpentry. Contents of the brick and masonry section include informative materials on bricklaying tools (brick trowels, joint tools, levels, squares, line and accessories, rules, hammers and chisels, tool kits) and cement masonry tools (tampers, screeds, jitterbugs, darby, bull floats, edgers and groovers, trowels, floats). A true-false test on cement masonry tools and a matching test on bricklaying tools are provided, but no answer keys are available. The carpentry section discusses and illustrates tools commonly used in carpentry work. Contents include informative materials and tests (simple recall, true-false, multiple choice) on these topics: hammers, hatchets, and wrecking bars; hand saws; planes and chisels; measuring and layout tools; tools for boring; and supplementary tools. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
F Page
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TX821330Y

ED227208

CE032946

Vocational Instructional Services

BASIC HAND TOOLS FOR BRICKLAYING AND CEMENT MASONRY

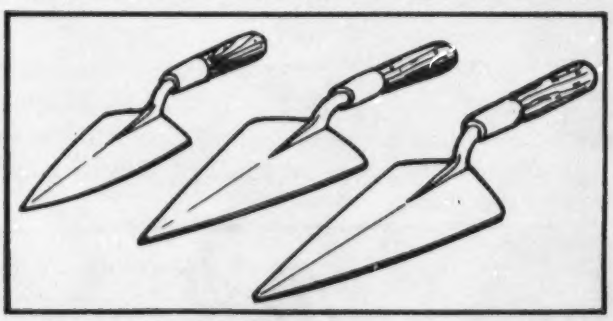
Very basic to the mastery of any craft is the knowledge and understanding of tools used in practicing it. One must know how to select proper tools, how to maintain and care for them, as well as, how to use them. In brick and masonry work the tools are relatively few and highly specialized. Many of the tools pertain to these two trades alone and are used for a single step in doing a task.

There are several things to keep in mind when selecting tools. Manufacturers make tools of various sizes, shapes, and of different materials. They also put them together in different ways. Quality in tools is of primary importance, and this almost goes hand-in-hand with price. Bricklayers should always buy the best tools they can afford. Not only will they pay for themselves by lasting much longer than cheap ones, high quality tools will produce a more professional looking finished job. Speed and efficiency gained from using the best tools will also cut the cost of labor. Personal choice of hand tools should always be considered when buying tools. After gaining some experience, beginners will learn the "feel" of their preferred, size and weight, tools. If a tool feels good in your hand it is likely the best one for you.

BRICKLAYING TOOLS

Brick Trowels

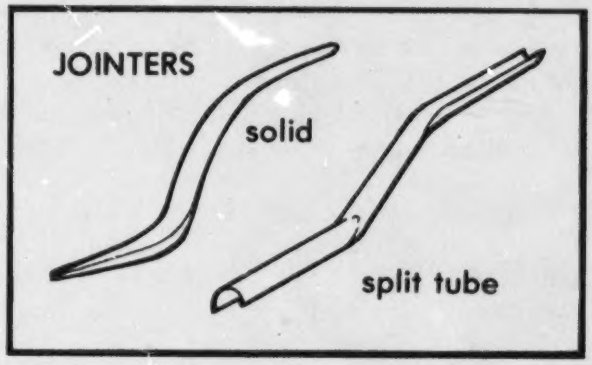
Trowels are to bricklayers what hammers are to carpenters - the most important tool in their kits. There are a great many different sizes, shapes, and weights available. Better quality trowels are forged from a single piece of high grade steel and ground into the desired shape and balance. The inner core of the handle is an extension of the blade itself. Cheap trowel blades are manufactured by stamping them from lower quality steel with the extension for the handle welded in place. Their price may make them look more attractive, but in the long run they are not a bargain. They will warp out of shape, wear down quickly, and break.



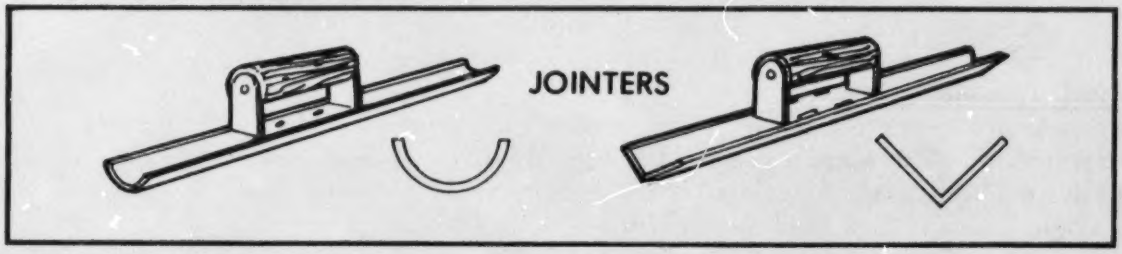
Brick trowels are made in many sizes and shapes depending on their use. There are pointing trowels, gauging trowels, margin trowels, and caulking trowels. There is one with a stiff, wide blade for lifting mortar out of the mortar box. This one is called a bucket trowel. However, most of the bricklaying work is done with a trowel that ranges from 10 to 13 inches in length and 4 to 7 inches in width. Points may be either sharp or rounded, and they may be wide heeled or round heeled. Selection should be based on the type of job to be done and upon individual choice.

Joint Tools

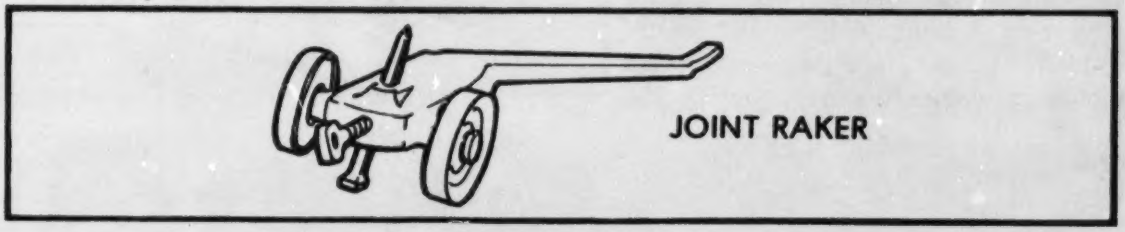
Joint tools are also called finishing tools or simply jointers. They are used to compress and shape the joints between units after the mortar has partially set up. This smooths the joint giving it a better appearance, and at the same time makes it watertight. Jointers may be forged metal rods or may be made from stamped split tubes. Their ends may be rounded or they may be shaped to make a "V" or some other configuration in the mortar. Their diameters or end shape may be 3/8, 1/2, 5/8, 3/4, 7/8, or 1 inch. Some are made the same size on each end while others have combinations of one-step graduations. The most common length of this type jointer is 11 inches.



Another type of jointer especially useful for dressing long horizontal joints is the joint runner or "sled runner". These may be either half-round convex or "V" shaped on the bottom, and may range from 1/2 inch up to 3/4 inch in width. Most common lengths are 14, 20, and 24 inches. They have a comfortable wood handle set up high enough to protect the knuckles.

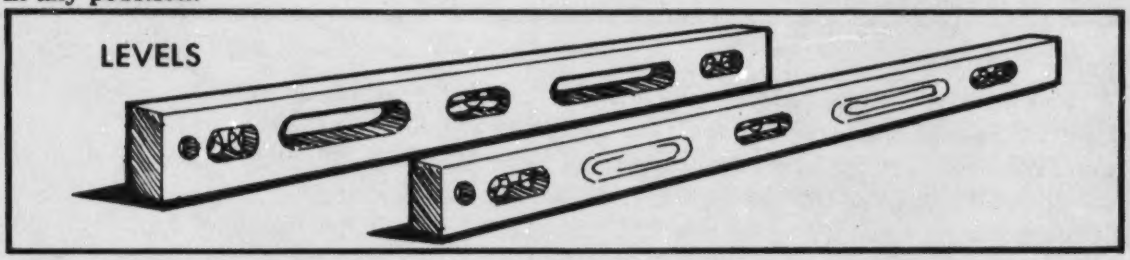


Joint rakers are yet another type of tool used in bricklaying. They range from an inexpensive simple design up to those with wheels and an adjustable nail. The more expensive rakers may be made of aluminum with a hardened handle squared off at the end to rod joints.



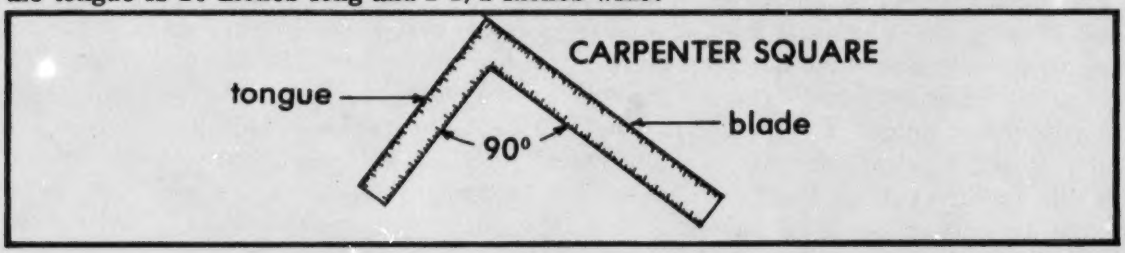
Levels

A combination level and plumb rule, often called "spirit level" or simply "level", is an absolute necessity in professional grade masonry. It is used constantly to insure that a wall is going up perfectly vertical or plumb and that every course of brick is as horizontal as possible. Very often the bricklayer will have a trowel in one hand and a level in the other. Levels range in size from less than a foot long to 6 feet in length. The most common sizes used in bricklaying are short ones from 14 to 24 inches for tight places, and longer ones of 48 inches for normal working conditions. They may be made of various metals, wood (usually mahogany), plastic, or combinations of these. They usually have hand-holds on either end. Paired horizontal bubble vials in the middle and vertical bubble vials on either end allow the level to be picked up and used in any position.



Squares

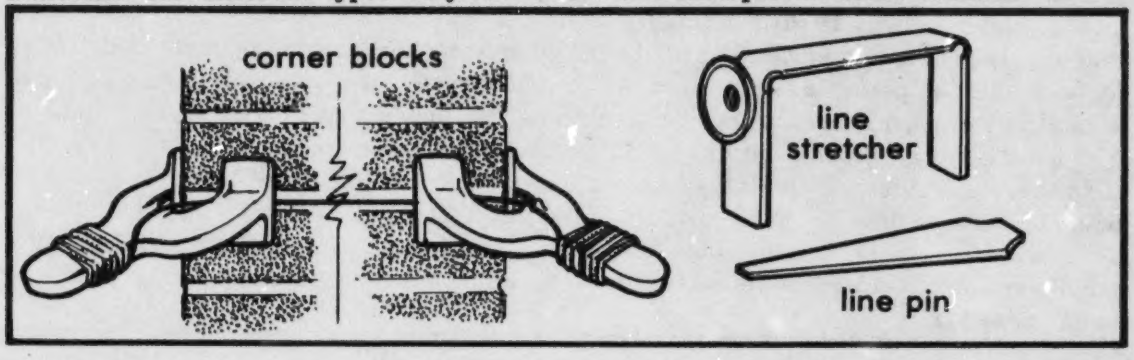
The carpenter's square or steel square is primarily used in bricklaying to lay up corners to a true 90 degrees, and to make the dry layout of the first course of block or brick in a masonry building. However, this tool has dozens of other uses. It can be used to lay out an octagon, reduce or enlarge sizes without losing dimensional relationships, find either the center or the circumference of circles, lay out the arcs for circular stairways, etc. A good one, in fact, has so many functions that entire books have been written about it. An instruction book usually comes with a new square which explains how to use the various scales and tables. A standard square has a body or blade that is 24 inches long and 2 inches wide. At a 90-degree angle to the blade, the tongue is 16 inches long and 1 1/2 inches wide.



Line and Accessories

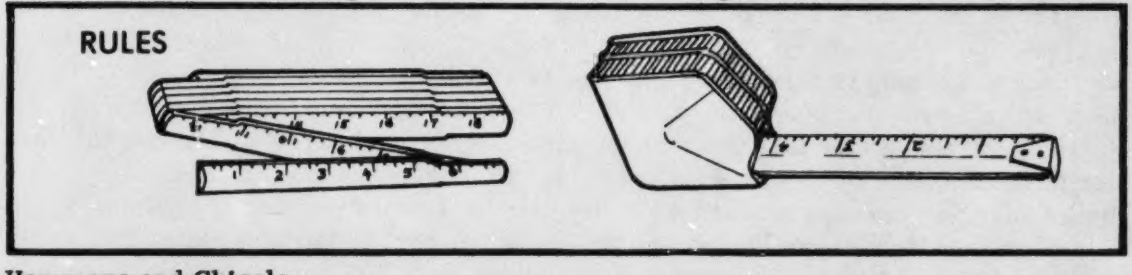
A bricklayer's line is an important tool for keeping the courses level and true. It is a heavy cord of braided nylon or some other material attached to the leads (corners) with corner blocks. By stretching the cord tightly, a line for accurately laying up the units is provided. Various colors and breaking strengths are available in lengths up to 1,000 feet. Besides the corner blocks mentioned earlier there are other accessories for using the bricklayer's line. There are adjustable line holders, line stretchers,

line blocks, line pins, and corner poles. These are made in various designs and materials for different types of jobs. Below are examples of some of them.



Rules

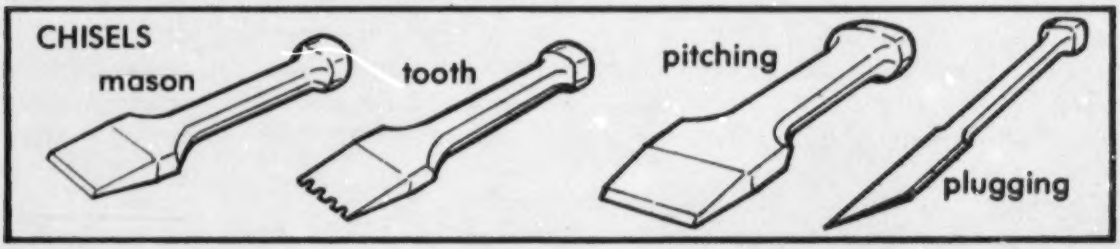
A bricklayer's skill is reflected by the accuracy with which a job is measured and laid out. For this purpose a bricklayer will have at least two kinds of rules - a folding wood rule 6 feet long and a steel tape from 10 to 12 feet in length. The wood rule has a 6-inch sliding extension in the first section for taking inside measurements. Both of these types of rules may be marked with from 6 to 10 brick spacing scales in addition to the regular markings. Also, for making long measurement, a bricklayer will have a retractable steel tape from 50 to 100 feet in length.



Hammers and Chisels

The brick hammer and brick set are tools especially designed and made for the art of bricklaying. The hammer head is square in shape and made of very hard tempered steel. Its edges are kept as sharp as possible for cutting or splitting brick. The blade part is then used to dress the rougher places after it is split. If the brick has to be an exact size or shape, a brick set is used. This is a special chisel-like tool that is struck with a brick hammer. The cutting edge can range from 2 1/2 up to 5 inches in width, and the overall length is usually 7 to 9 inches. A brick hammer may weigh from 10 ounces up to 24 ounces.

Other tools similar in design to the brick set are the tooth chisel for cutting soft stone, the mason chisel for cutting cinder and cement blocks, and plugging chisel used to clean mortar from brick joints.



Tool Kits

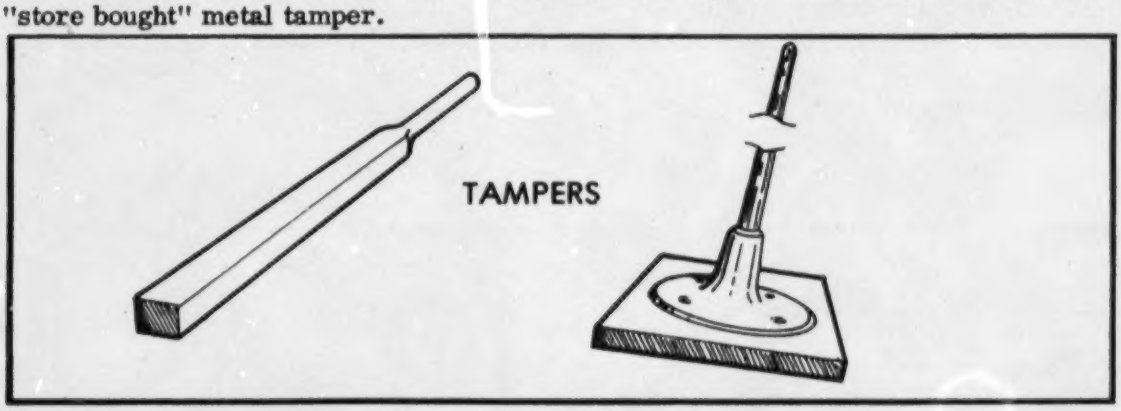
The final item for professional bricklayers is something to carry their personal tools in. This is most often a heavy canvas bag from 18 to 24 inches long and 13 to 18 inches deep. It will usually contain at least two trowels, jointers, corner blocks and line, cut nails and line pins, a folding rule, steel tape, and a short level. Long levels are carried in a separate bag or strapped to the outside of the tool kit. Other items usually found in the tool kit are knives, pencils, soap stone, and safety glasses or goggles for eye protection. An experienced bricklayer will also have a small container of antiseptic and bandages for minor cuts and scrapes in the tool kit.

CEMENT MASONRY TOOLS

A few of the tools used in cement masonry are the same as those of the bricklayer. However, since there is so much difference in the types of work, tools may be varied in design even though they have the same name. Trowels are an example of this, as shall be discussed later.

Tampers

After forms are built and the area filled, the first tool a mason will use is a tamper. If concrete is laid on a base that is not firm, cavities can develop between them. This may result in the concrete breaking and falling into the cavity. The ground must, therefore, be tamped into a firm mass to provide a good solid base. The tool used for this may be a 4 x 4 piece of lumber with a hand hold taped on one end, or it can be a "store bought" metal tamper.

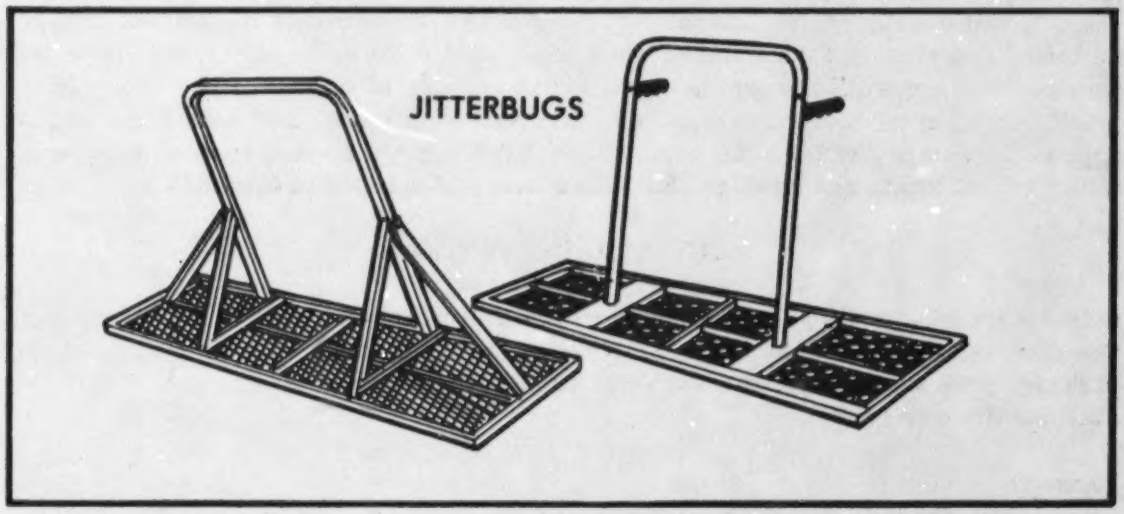


Screeds

During the pouring and as soon as concrete is placed the mason will use a screed or strike-off board. This tool is used to level off the concrete between the forms. Since it has to span the width of the slab and be moved back and forth across the top of the forms, a strike-off board must be a foot or more longer than the slab width. Almost anything that is rigid and having a very straight edge can be used for this. Often a reinforced 1 x 4 or a 2 x 4 piece of lumber serves the purpose. However, a professional will usually have a magnesium or aluminum "straightedge" to level concrete.

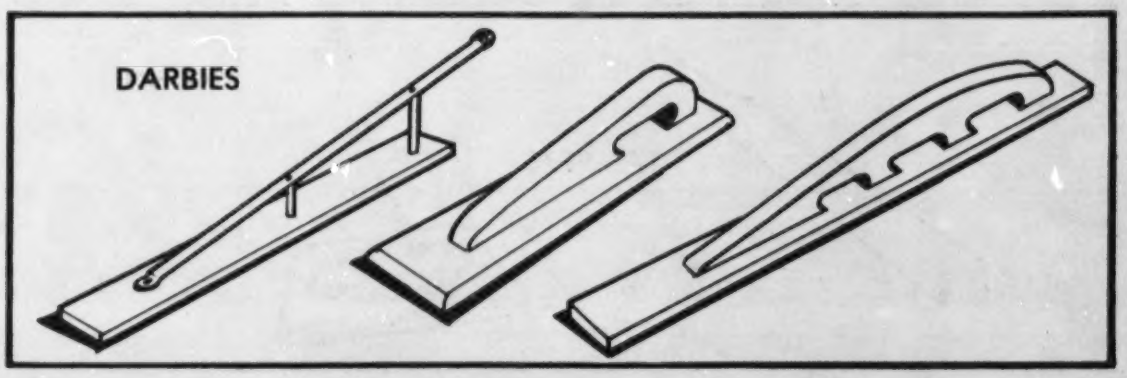
Jitterbugs

Jitterbugs are a type of tamping tool used to push the larger aggregate down below the surface. This compacts the concrete and raises very fine aggregate and mortar to the top for a smoother finish. They may have a grill of either round hole metal or expanded steel and range from 3 to 4 feet in length.



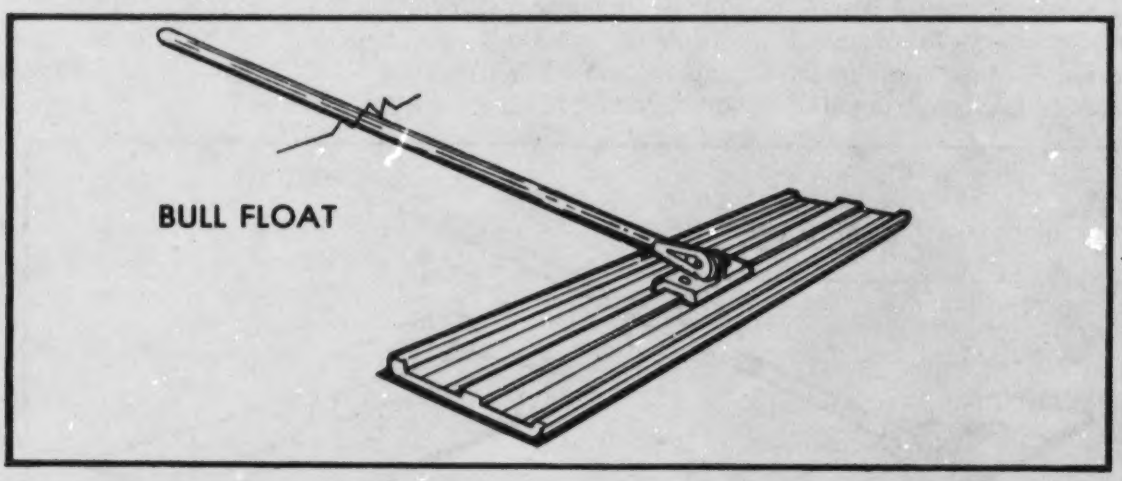
Darby

After concrete has been screeded and compacted it is smoothed further with a darby. This is a tool from 30 to 80 inches long with a raised handle. Working the surface with a darby lowers the high spots and fills any depressions. The tool may be made of wood, magnesium, or aluminum.



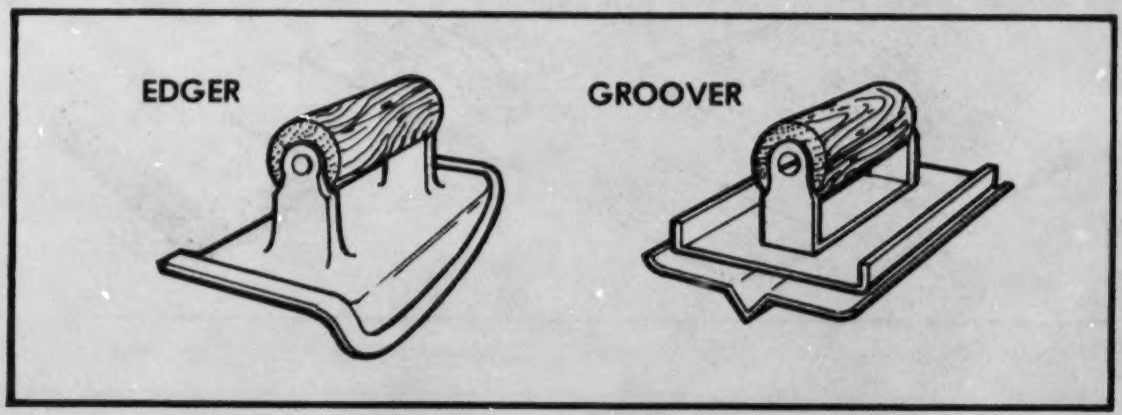
Bull Floats

If the surface area is very large the mason will probably use a bull float instead of a darby. They are used for the same purpose, and the long handle allows for more "reach". The size of this float ranges in width from 6 to 7 inches and from 42 to 60 inches in length. The handle may be up to 10 feet in length with extensions to make them even longer.



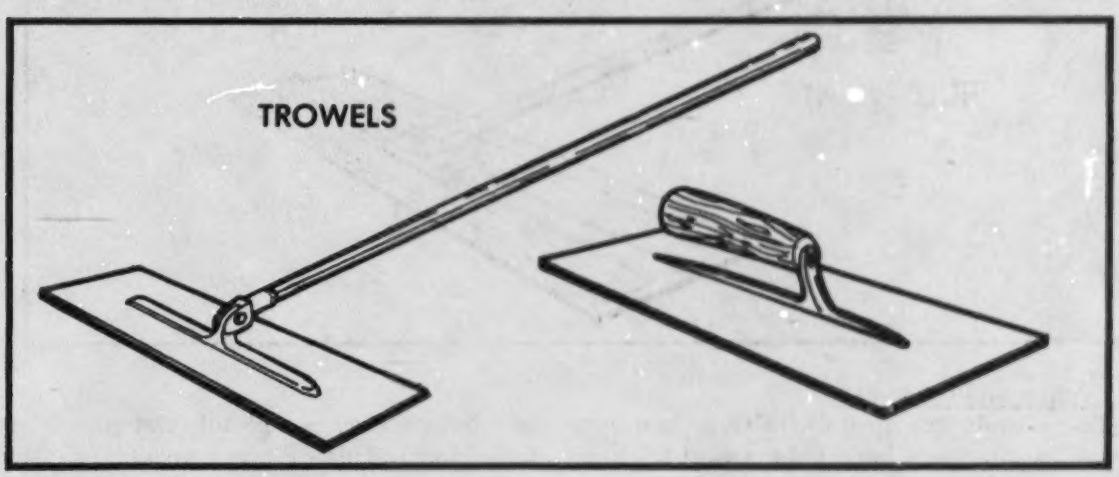
Edgers and Groovers

These tools are used to finish up concrete slabs before they completely set up. They are similar to a hand held trowel in design, but if long edges or large areas are being finished walking edgers and groovers with long handles are available. These are usually larger than the hand held type. One side of an edger is turned down at a 90-degree angle to form an arc. The radius of the arc may vary in graduations of 1/8 inch to over 1 inch. This tool is used to round off edges of concrete work in order to improve appearance and to reduce damage to the edge. Groovers are built with a knife like projection on the middle of their underside running their length. The projection is called a bit and is used to cut control joints in the surface of concrete. If the slab breaks due to heaving or contracting, the crack will most often occur in a joint and be hidden. Length of the bit may be from 1/8 up to 1 inch.



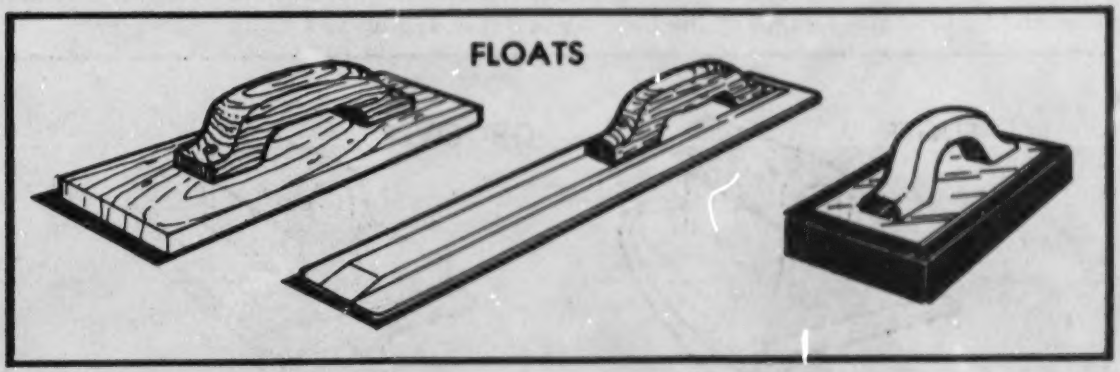
Trowels

Some of the trowels used by a cement finisher are exactly the same as those used by the bricklayer, but for a different purpose. They are used for patching or repairing concrete and for "buttering" concrete with cement. The mason will usually have a regular and a pointing trowel for this. Regular cement finishing trowels come in a great many sizes and designs. Smaller, one-hand trowels are usually rectangular in shape and range from 3 to 5 inches in width and from 8 to 20 inches in length. Long handled trowels designed to allow the mason to stand up and use both hands are larger. Most common sizes are 24 and 30 inches long by 5 inches wide. Better trowels are constructed of either high carbon steel or stainless steel.



Floats

Very similar to the steel trowel in use and design, the float is used to smooth concrete. Usually made of wood, the tool leaves a rougher texture on the surface. This is an important consideration where traction is a factor. Sidewalks, stairs, porches, and driveways are almost always finished with a wood float. Other materials used to build floats are magnesium and compact molded rubber. Most common sizes are 3 1/2 to 5 inches wide and from 12 to 20 inches long.



KNOW YOUR TOOLS
CEMENT MASONRY TOOLS

REGULAR TRUE-FALSE TEST

Directions: Read each of the following statements carefully before making a mark. Some of the statements are true and some are false. Indicate the answer selected by placing a small circle around the T or F in the corresponding right-hand column.

Example:	1. Cement is used to make concrete.	(T)	F
1.	Wood floats leave a rougher finish on concrete than steel.	T	F
2.	Sidewalks are most often finished with a steel trowel.	T	F
3.	Pointing trowels are used by the cement mason for "buttering".	T	F
4.	The work of the cement mason is similar to that of the bricklayer.	T	F
5.	A piece of 4 x 4 lumber with a hand hold is called a "jitterbug".	T	F
6.	A screed is also called a strike-off board.	T	F
7.	Screeds must be longer than the distance between the forms.	T	F
8.	Groovers provide a place for a cement slab to crack.	T	F
9.	The first tool used after cement is placed is a darby.	T	F
10.	Jitterbugs are used to bring large aggregate to the surface.	T	F

KNOW YOUR TOOLS
BRICKLAYING TOOLS

MATCHING TEST

Directions: One item from column I is closely related to or associated with an item in column II. Place the capital letter of the associated term in column II in the blank space at the left of the number in column I.

Example: B 1. Used for eye protection.

A. Hat
B. Goggles
C. Gloves

___ 1. Tool with a blade and a tongue.

___ 2. Used for lifting mortar from mortar box.

___ 3. These may be caulking, margin, gauging, or pointing.

___ 4. Treatment for minor cuts and scrapes.

___ 5. Used to check for plumb.

___ 6. Compresses and shapes joints.

___ 7. Expensive ones have wheels.

___ 8. Used on long horizontal joints.

___ 9. Stretches between corner blocks.

___10. Almost always in pairs.

___11. May be plugging, pitching, mason, or tooth.

___12. Usually six feet long.

___13. May be 50 or 100 feet long.

___14. Specific type of chisel.

___15. Has a head and a blade.

A. Trowels
B. Line
C. Jointer
D. Square
E. Joint raker
F. Corner blocks
G. Spirit level
H. Bucket trowels
I. Brick hammer
J. Antiseptic
K. Sled runners
L. Brick set
M. Folding rule
N. Chisels
O. Steel tape
P. Knife
Q. Tool kit

TX8213304

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
F Page
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BASIC HAND TOOLS OF THE CARPENTER

A key factor in carpentry work is knowing tools of the trade and learning to select the proper tool for the job. Due to the broad range of activities a carpenter must do, there is a great variety of tools that are needed. Laying out a building, framing, roofing, and interior work all require special tools that enable a carpenter to work faster and more accurately. We will not attempt to discuss every one of them here. Instead we will present only those most commonly used.

HAMMERS - HATCHETS - WRECKING BARS

Nail Hammers

The hand tool most often used by the carpenter is a claw hammer. These come in two types - the curved claw considered the best for driving and pulling nails, and the ripping hammer which has a claw with little or no curve. The latter is better for dismantling operations since the claw can be driven between boards more easily.

Claw hammers come in weights ranging from a 7 ounce head up to 20 ounces or heavier. The most common sizes are those in the 13 to 20 ounce category with the most popular being the 16 ounce. This is known as the standard hammer size. Usually the nail size determines the weight of the hammer used - light hammers for small nails and heavy hammers for large nails and spikes.

The steel in the hammer head should be of high quality since its face must strike hard objects and not be damaged. If a hammer is made of inferior materials the striking surface will chip or flatten. One should be careful never to hit anything that is harder than the face of the hammer itself. High quality hammers are usually equipped with tough, durable wood handles. A higher quality handle helps absorb the shock of hammer blows that would otherwise be transmitted to the carpenter's arm. However, due to the type work usually done with them, ripping hammers often have steel handles.

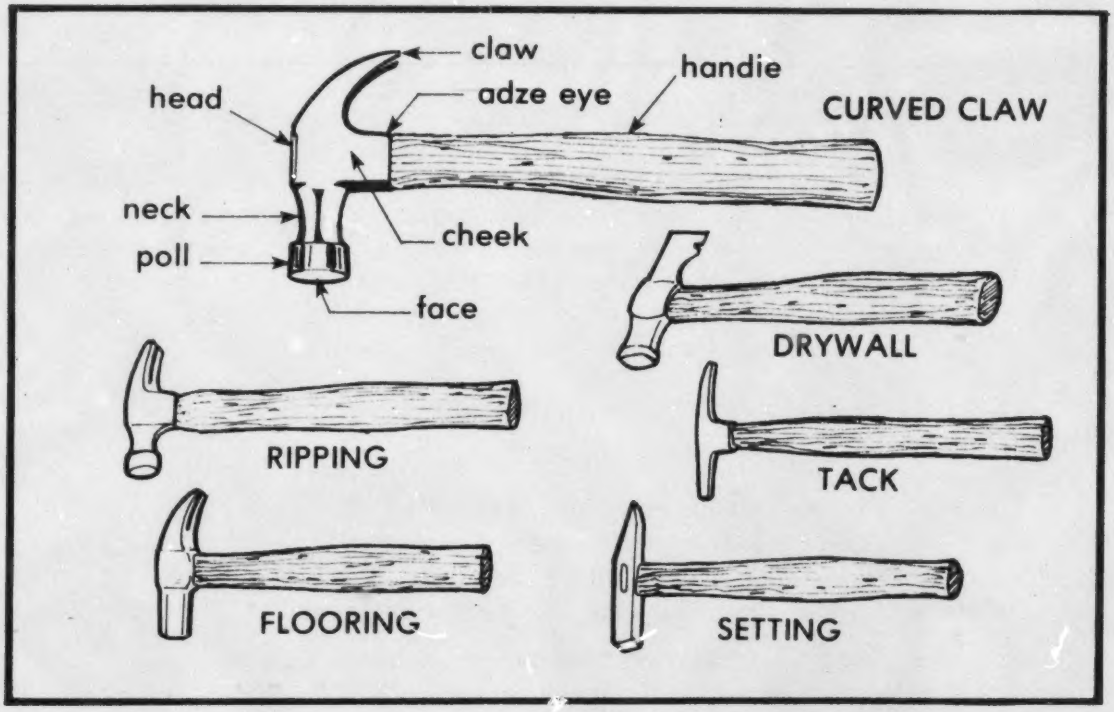
Before leaving the subject of hammers, perhaps we should mention some others that are designed for more specialized work:

a. Flooring Hammer - This hammer is for laying tongue-and-groove materials.

b. Drywall Hammer - This one has a specially designed face for putting up gypsum board panels.

c. Tack Hammer - Tack hammers are used to drive tacks and small nails. The magnetized claw end will not pull nails but is used to pick up and start tacks.

d. Setting Hammer - This is also a tinsmith's tool. In carpentry it is used to start and drive small wire brads because of its square face. The corners are less likely to mash fingers.



Hatchets

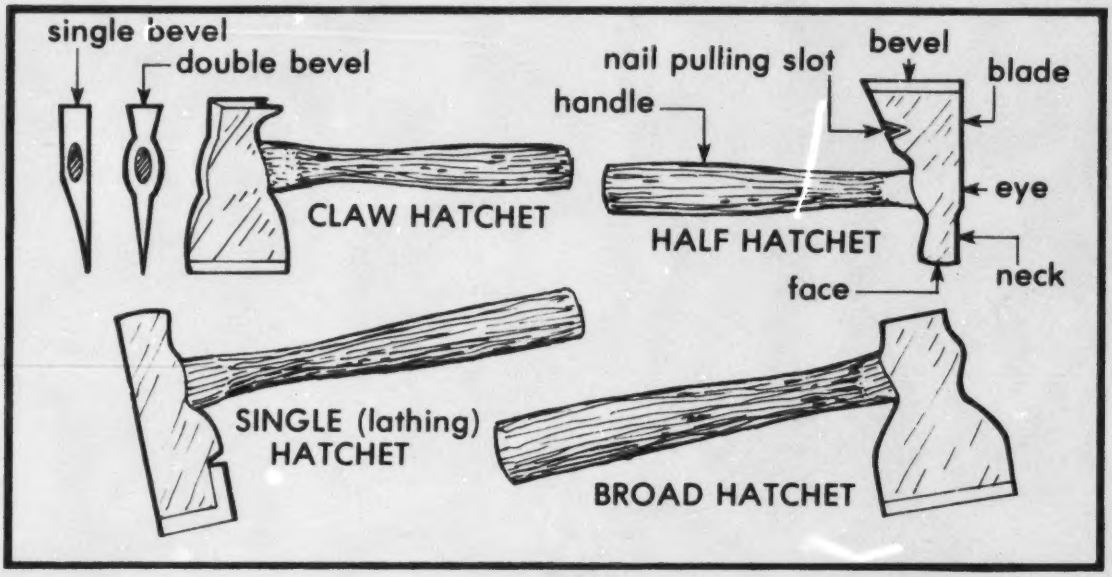
Most hatchets are considered tri-purpose tools. They are used to drive nails, make rough cuts, and pull nails. For construction work such as roofing, form building, and jobs where large nails are required, the hatchet may be preferred to the hammer. Usually a roofing nail is driven with one strike of a hatchet. The hatchet may take the place of a hand plane or ripsaw to remove excess wood. Cutting away wood is faster with a hatchet than with a hand plane or ripsaw. Hatchets, like hammers, are made in several types, shapes, and weights for specific uses.

a. Claw Hatchet - The claw hatchet is usually used for heavier work than the half hatchet. Yet, it is considered an all around hatchet for carpentry work. It can be used like a hammer for driving and pulling nails or as an ax for splitting, hewing, or cutting wood. It is sometimes used as a flooring, form building, and frame building hand tool.

b. Half Hatchet - This hatchet is the most commonly used hatchet for driving nails. It has a nail pulling slot on the inside of the blade, whereas the claw hatchet has a claw with a beveled nail slot on the head. The double beveled half hatchet can be used for light cutting and, like the single beveled claw hatchet, can be used to hew a line.

c. Single (Lathing) Hatchet - This hatchet is a popular tool for laying roofing. It is considered the best tool for laying wood shingles. The cutting blade is useful in splitting shingles, and the head is made to drive shingle nails. Due to the fact that this tool is lighter than the half hatchet, it is used only for the light work.

d. Broad Hatchet - A broad hatchet is used mainly for rough cutting, notching, splitting, and trimming materials. The head is used to drive stakes and large nails.



Wrecking Bar

Other names for wrecking bar are ripping bar and pry bar. This is a necessary tool for pulling large nails, tearing down buildings, opening crates, and dismantling many kinds of wood structures. It is a protector of hammer and hatchet handles, screwdrivers, and wood chisels. A wrecking bar should be used if there is too much strain being put on a handle when pulling a nail. The wrecking bar is not a crow bar and should not be used to pry stones, timbers, or machinery.

The most common wrecking bar is 24 inches long, but bars may be as short as 12 inches or as long as 3 feet. The octagon-shaped tempered steel is usually 3/4 inches in diameter, but this too can vary from 1/2 to 7/8 of an inch.

Student_____

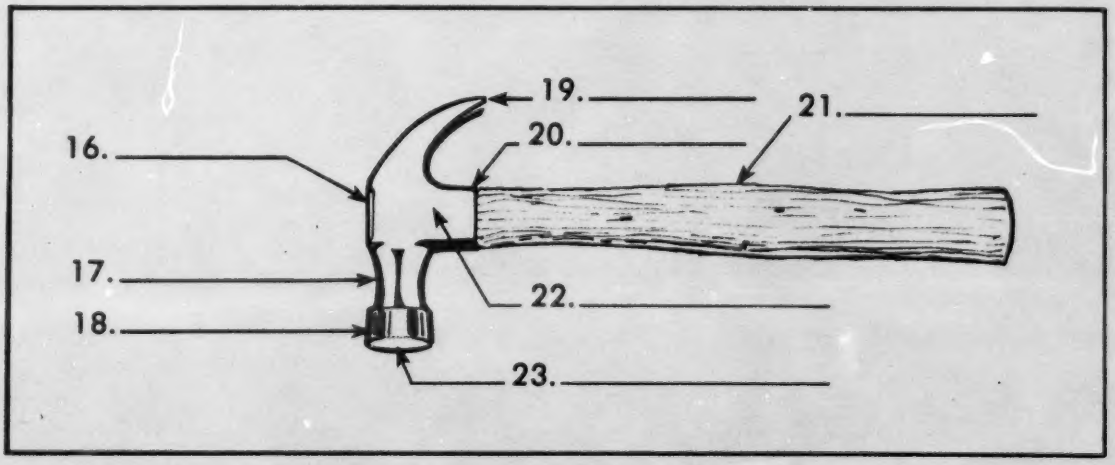
Class_____

KNOW YOUR TOOLS

Hammers - Hatchets - Wrecking Bars

Fill in the Blanks. Read each statement carefully. Select a word or words which will complete the statement correctly. Place your answer in the blank space to the right of each statement.

1. The best hammer for pulling nails has a _____ claw. _____
2. The hammer used for taking things apart is a _____ hammer. _____
3. Hammers most often used weigh a _____ . _____
4. On the job a hammer should match the _____ size. _____
5. A cheaply priced tool usually means it is _____ quality. _____
6. A good hammer handle absorbs the _____ of hitting. _____
7. A tack hammer's claws are _____ to pick up tacks. _____
8. The face of a setting hammer is _____ in shape. _____
9. Tongue-and-groove boards are nailed with a _____ hammer. _____
10. Most hatchets will perform _____ jobs. _____
11. Many prefer to use the hatchet for laying _____ . _____
12. For form building, framing, and flooring the best all around tool is a _____ . _____
13. Hatchets may be either single or double _____ . _____
14. The best tool for pulling large nails is a _____ . _____
15. The size of a wrecking bar is measured in _____ . _____



HAND SAWS

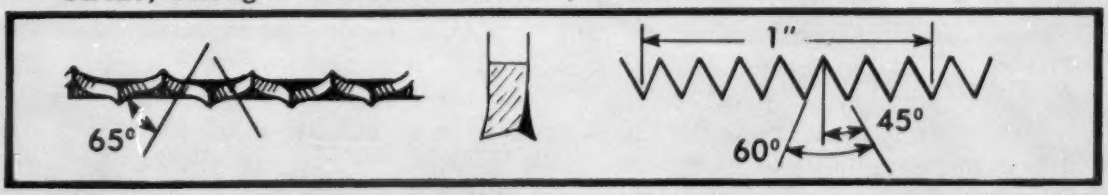
Hand saws are considered to be very important hand tools in most tool kits or in well equipped workshops. Crosscut and rip saws are still used for straight sawing on special jobs in construction work. If there is a limited amount of cut off and ripping work to be performed, the hand saw may be preferred over the power saw. A hand saw may be the only sawing tool that can be used in close places. Other reasons for using the hand saw are: Power may not be available for hand power tools, work can be completed faster on some jobs, work is easier when handling light tools in some locations, and it may not be economical to replace certain hand tools with power tools.

Points to Consider when Selecting Hand Saws

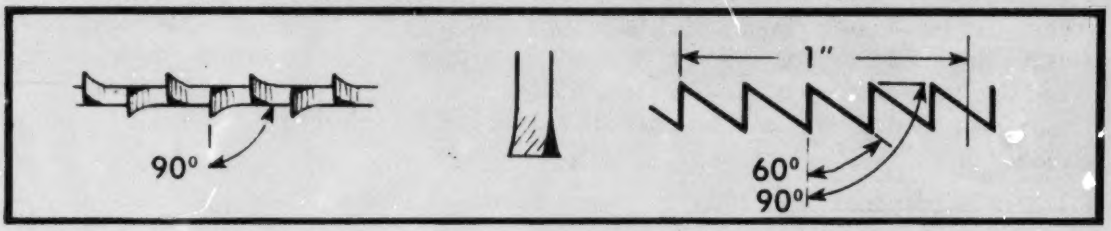
1. The price of a hand saw is usually governed by its quality.
2. The size of a crosscut or ripsaw is determined by the length of blade from the toe to the heel. The sizes of most other saws are also determined by the length of the blade.
3. The fineness or coarseness is determined by the number of points (teeth) per inch. For example, a 9 point saw has 8 teeth per inch.
4. A fine tooth saw is better for sawing a smooth and accurate cut. It is used mainly to saw small material (boards, molding).
5. A coarse saw is considered best for rough work and sawing fast. It will also cut green wood faster than a fine saw.
6. The saw blade is usually ground and polished. In most cases the tooth edge is thicker than the back edge. The teeth are set wider than the thickness of the blade to prevent it from binding or bending when making a cut. The amount of set depends upon the type of wood (soft, hard, dry, wet, or green) or lumber to be sawed.
7. The blade of a crosscut or ripsaw may be either skewback or straight. There are advantages in using both types of blades. The straight back may be used as a straight edge and the skewback for slightly curving cuts.

Types of Hand Saws

a. Crosscut Saw - The crosscut saw is the most commonly used of all hand saws for general carpentry work. Teeth on this saw are shaped to cut across the grain of wood. From perpendicular, the front of the tooth is 15 degrees and the back 45 degrees. The most commonly used crosscut saws have from 8 to 11 teeth per inch of blade. The length of blade varies from 18 to 26 inches. The longest blade is the most popular. Fast and coarse cuts are made with a small number of teeth to the inch. Ten and 11 point saws are used to cut finishing materials such as moldings and door facings. Jointer work is usually done with a 10 point about 22 inches long. This size saw is suitable for cutting plywood or paneling. Even though about 75 percent of the cutting is accomplished on the forward stroke, cutting is done on both strokes, forward and backward.



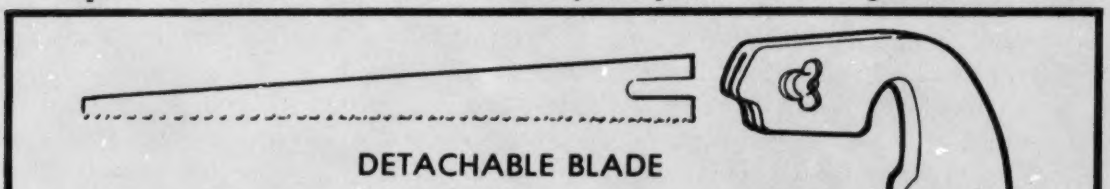
b. Rip Saw - This saw is used to cut with the grain. The overall angle of rip saw teeth is the same as that of a crosscut saw, but the forward angle is only 8 degrees from perpendicular. Teeth cutting edges are square, and the back angles are 52 degrees. This equals a 60 degree angle between teeth. The most popular sizes are 24 to 26 inch blades with 5-1/2 to 7 teeth per inch.



Rip saw teeth are not beveled; therefore, the teeth rip the grain of wood instead of cutting it. The tooth action may be compared to a wood chisel; it cuts at a 90 degree angle as it is pushed forward.

c. Keyhole Saw - The keyhole saw is used to saw "cutouts". It may be found as a single blade saw or a nest of saws (one handle with two or three replacement blades). One of the blades is used for cutting metal. This saw resembles the compass saw, but the standard blades range from 10 to 20 inches with 10 to 15 points per inch. Curves, holes, and straight sawing cuts are usually smoother when done with a keyhole saw than with a compass saw. It is used to make smaller "cutouts" than can be made with a compass saw.

d. Compass Saw - This saw is used to cut curves and circles, starting a cut from a hole bored by a brace and bit, and to cut holes for pipe outlets. The blades taper from back to front. Compass sawblades are 12 to 14 inches in length with 8 or 10 teeth to the inch. The shape of the teeth resembles those on a crosscut saw. Most compass saws are equipped with a wing nut on the handle which is used to change blades and reverse blades for undercutting. The blade is slotted to allow it to be pushed into the handle on each side of the wing nut. Compass saw blades may be purchased in a nest of three, ranging from medium to sharp taper. One blade in a nest is usually tempered for cutting nails or metal.

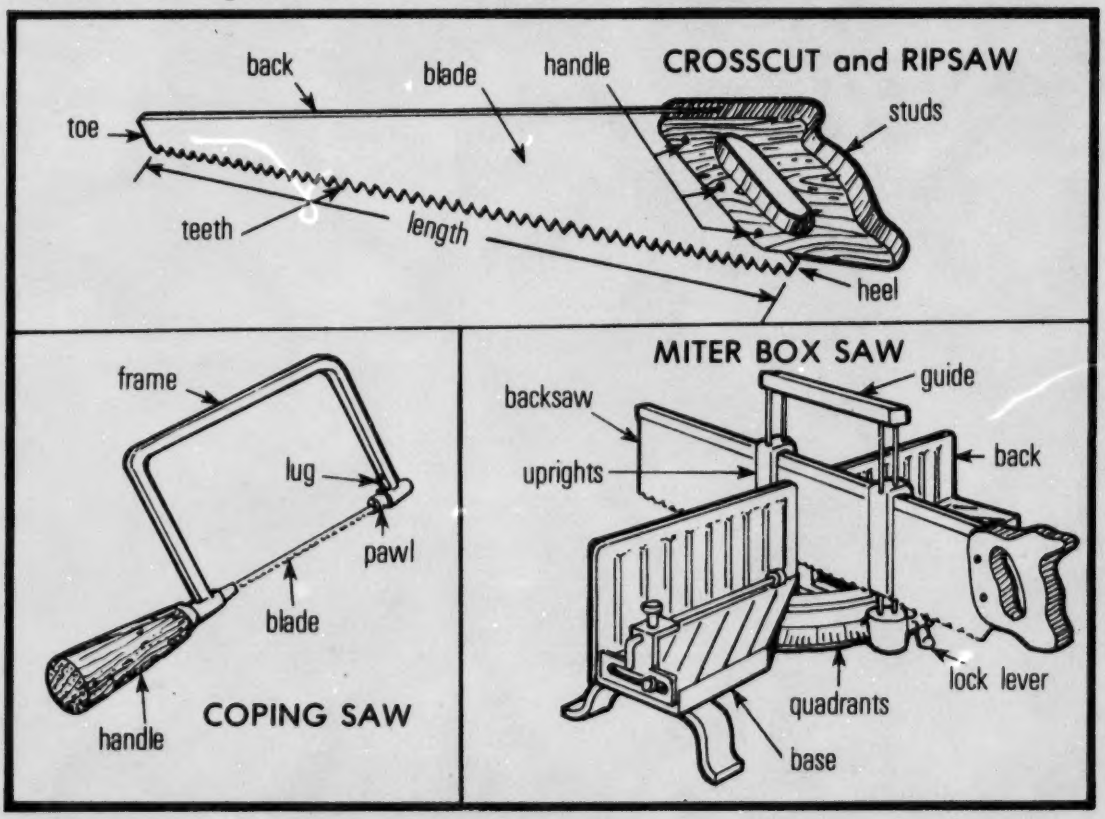


e. Coping Saw - This saw is designed to cut thin or light wood. It is used to cut curves, for scroll work, and shaping the ends of moldings. Blades of this saw are about 1/8 inch wide and are made of thin metal. The overall length may vary from about 6-1/2 to 7 inches with 15 points to the inch. Blades on coping saws can be adjusted at various angles to the frame. Blades are inserted to cut either on the push stroke or the pull stroke. The teeth point in the direction of the cutting action. Coping saw blades may be acquired with a bent pipe or loop for connecting the blade to the pawls. Blades are tightened in the frame by turning the handle clockwise.

f. Backsaw - Backsaws are used to make accurate and smooth cuts. The large backsaw is known as a miter box saw. They may range in length from about 22 to 30 inches. The width of the reinforced blade varies from 4 to 6 inches. Small backsaws are found in lengths from 10 to 16 inches, and the number of teeth per inch may vary from about 11 to 15. All backsaws and dovetail saws are reinforced the full length down the back edge of the blade. This saw is generally thought of as a crosscut type saw. It is used mainly for squaring, cutting angles, and sawing small materials.

g. Dovetail Saw - The dovetail saw is used to make cuts similar to the backsaw. It has a lighter and thinner blade than the backsaw. The straight handle is fitted on part of the reinforced metal backing. The saw kerf (cut or slit) is more narrow than the backsaw kerf. This type of saw is used mainly for cabinet, small framing, and molding work.

h. Miter Saw - The backsaw becomes a miter saw when it is placed in a frame (wood or iron) for making angular and square cuts on stock such as door trim (facing), window facings, framing and molding around panels, and cornices. The iron miter box has a pivoting base that is graduated from 90 to 45 degrees. This allows the saw to be used for cutting angles from 90 to 45 degrees. The backsaw is held in the rigid iron frame at a vertical position to the cutting table or base. The wood miter box usually is made of three pieces of board. The sides are 1 inch thick and the bottom 2 inches thick. This box may have one 90 degree slit and two 45 degree slits for the backsaw use.



Student_____

Class_____

KNOW YOUR TOOLS

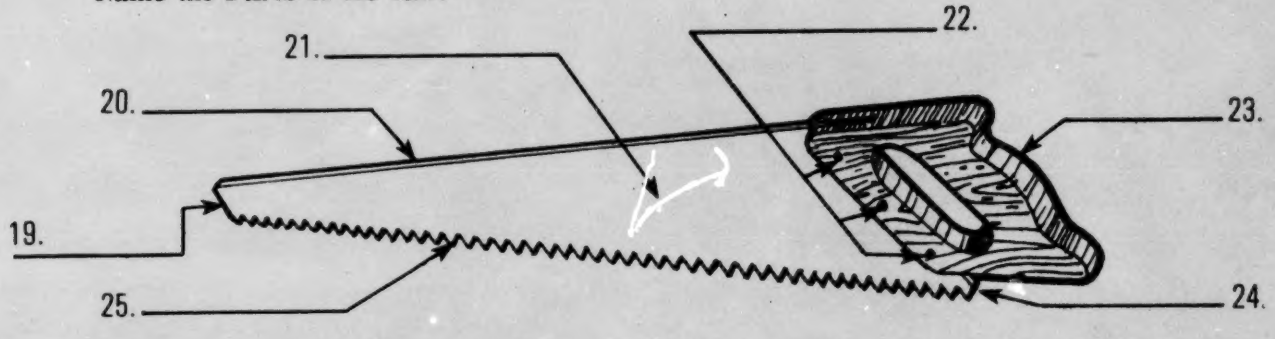
Hand Saws

True - False Test

Select your answer by making a circle around the T or F in the right hand column.

1.	The quality of a saw determines its price.	T	F
2.	Ten and eleven point saws are considered coarse.	T	F
3.	The teeth of a rip saw can be compared to a chisel.	T	F
4.	Green wood is easier to cut with a fine toothed saw.	T	F
5.	A crosscut saw will cut on both strokes.	T	F
6.	The most popular length of crosscut saw is 26 inches.	T	F
7.	Rip saw teeth are beveled so that they slice the wood grain.	T	F
8.	One saw handle with three replacement blades is called a gang of saws.	T	F
9.	Keyhole saw blades are reversed for cutting on the pull stroke.	T	F
10.	A miter box saw is the same as a large backsaw.	T	F
11.	The cut of a saw is called its kerf.	T	F
12.	The tool used for scroll work is a coping saw.	T	F
13.	Dovetail saws are flexible for cutting angles.	T	F
14.	Pipe outlets are cut with a backsaw.	T	F
15.	The teeth of a backsaw are beveled.	T	F
16.	A ten point saw 22 inches long has 122 teeth.	T	F
17.	Saw teeth are thicker metal than the back of the blade.	T	F
18.	Miter boxes can be used to cut cornices.	T	F

Name the Parts of the Saw:



PLANES AND CHISELS

Hand Planes

The hand plane is a paring or shaving tool that is used for the following purposes: planing of pieces of boards to smooth the surface, either on the face, end, or edge; planing to straighten or smooth surfaces for gluing; planing to correct the size or dimension of an object or piece of material; and planing to eliminate twists or crowns (high parts on the face of a board). Hand planes are also used where power jointers or planers are not available to smooth, to cut a board to a certain size, or to correct board defects.

The cutting principle of all hand planes is about the same. A sharp blade is held in place by clamps in a block of wood or iron and the block is pushed over the surface to make the cut. Some of the first hand planes were made almost entirely of wood except for the cutting assembly. Planes are similar to many other knife edge tools (chisels) in that they are made for different uses; therefore, they are different in length, weight, width, and type of cutter blade.

The jack plane is considered to be the most useful of all planes. Its size range is between the jointer and smoothing planes. The length of planes may vary from 4 to 24 inches, the block plane being the shortest and the jointer plane the longest.

The Kinds and Use of Planes

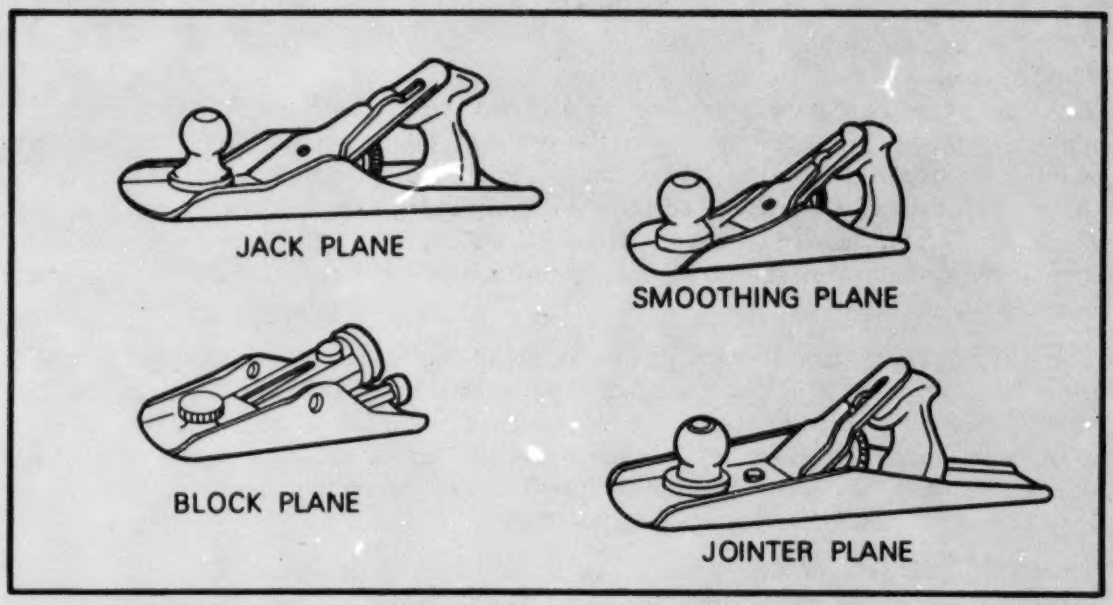
a. Jack Plane - This plane is capable of taking the place of the block, smoothing, and jointer plane on most jobs. It is 11 - 1/2 to 15 inches long and is used mainly to smooth a surface while cutting with the grain. It can be used for chamfering (cutting board corners to form a bevel), smoothing large surfaces, and straightening board edges. The most commonly used jack plane is 14 inches long with a 2-inch wide cutter blade.

b. Smoothing Plane - A smoothing plane is from 5-1/2 to 10 inches in length. It is used mainly for smoothing, surfacing, and finishing work. It can also be used to work end grain on boards. A plane with a 1-3/4 inch wide blade, 8 inches long is considered standard.

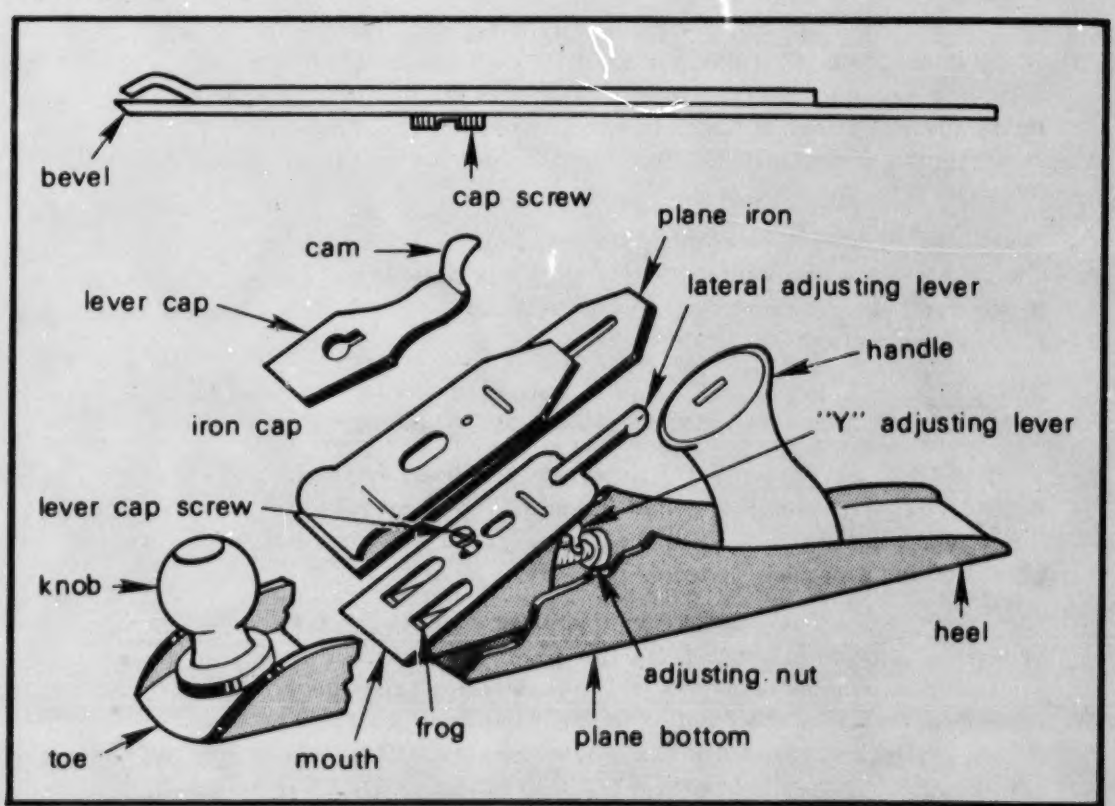
c. Block Plane - This plane is used for cutting end grain or working small pieces of materials. The average length of the block plane is about 6 inches.

d. Fore and Jointer Planes - These planes are used for straightening the edges of long pieces of material or wood objects. The fore plane is 18 inches long, and the jointer plane is 22 to 24 inches long. Both the fore and jointer planes are also used for smoothing edges.

e. Special Planes - The rabbet (for rabbeting edges), combination (for dadoing and grooving), and the circular plane (for planing concave or irregular surfaces) are of less importance than the jack, smoothing, and block planes. Generally, special planes are used only for finishing type work. The duplex or full nose rabbet planes can be used to plane into corners. The most commonly used rabbet plane is 8 inches long with a 1/2 inch blade.



The carpenter should become familiar with the principal parts of the plane in order to disassemble, clean, sharpen, make adjustments, and use the tool. The parts of a jack plane are as follows:



Chisels

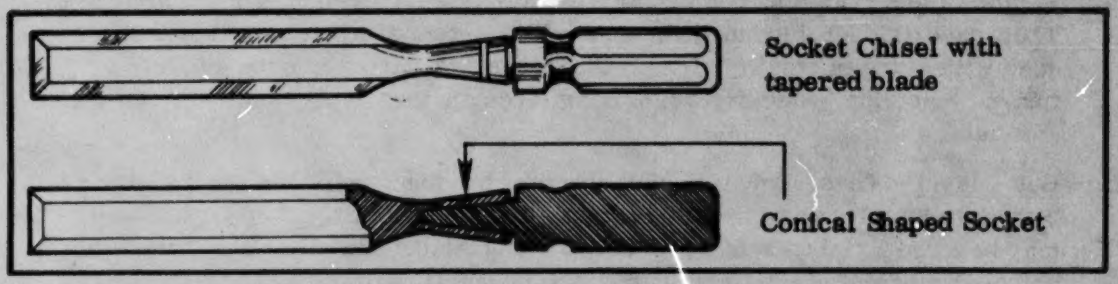
A wood chisel is another important tool for the carpenter's tool kit or shop. It is used mainly for constructing joints and shaping and fitting wood. The best quality chisel blades are made of high grade tempered steel and can be sharpened to hold a good cutting edge. They range in width from 1/8 up to 3 inches, but for most work the carpenter usually has a selection which includes 3/8, 1/2, 3/4, and 1-1/4 inch sizes.

Blade lengths can vary as well. The most common sizes are 3 to 6 inches long, but sometimes are much longer. Those of longer length are called "firmer" chisels, medium lengths are "pocket" chisels, and short ones are "butt" chisels. They are also given names depending on what they are designed for. They may be known as paring, mortise, or flooring chisels.

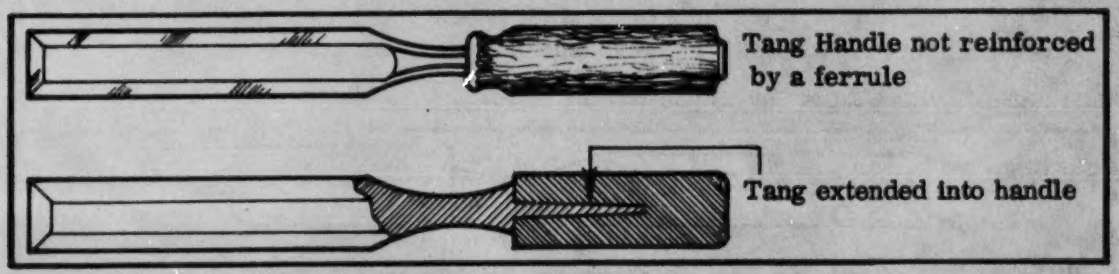
The materials used in the handle and how the blade is connected to the handle are important factors in selecting a chisel.

Handle Attachment

a. Socket Chisels - This is the most common type of chisel used in carpentry. Due to the handle being fitted into a steel socket, the chisel can withstand harder blows from a mallet. These chisels are used for rough woodwork and framing. The blade is also thicker than the blade on a tang chisel. The most common sizes are: 3/8, 1/2, 3/4, and 1-1/2 inch.



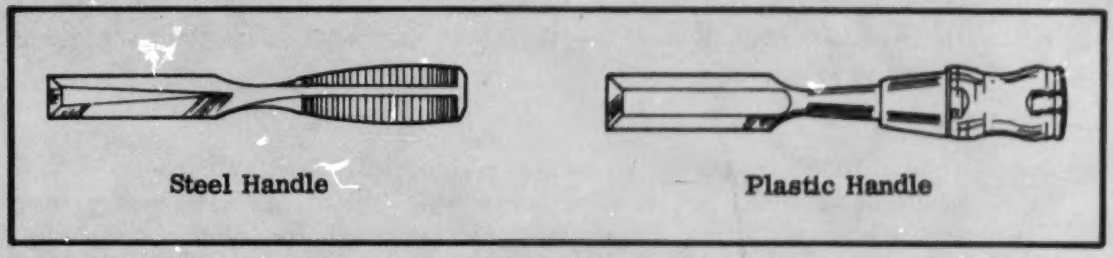
b. Tang Chisels - The handle of a tang chisel is similar to that of the socket chisel except that the tang is fitted into the handle. Less driving pressure should be applied to this type of chisel than to the socket chisel. Tang chisels are better for hand work, such as paring, because of their light weight and balance. The tang of a chisel is the spike-like handle part of the chisel fitted into the handle. This chisel usually has a plastic handle. The handle often has a metal ferrule to reinforce it against damage.



c. Heavy-Duty Chisels - These chisels are made so that a steel hammer can be used on the head without damaging the handle, head, or ferrule. Two of the most common types of these chisels are:

(1) Steel handle surrounded by wood
(2) Molded plastic handle

The steel handle chisel is actually one piece of metal that includes the blade, shank, ferrule, and handle. The metal head and upper end of the handle are often molded in plastic. The head and lower handle (tang) parts are two different pieces of metal. These types of chisels are used for rough construction and where heavy cutting is required. Mallets are not usually used as a driving tool on heavy duty type chisels due to the chisel's steel head and the force needed to do heavy duty type work.



Wood Chisels Classified According to Chisel Use

a. Paring Chisel - Paring chisels are of two types, straight and beveled edges. They have thinner blades than most other types of chisels. They are seldom used with a driving tool (mallet). Chiseling and paring is done entirely by hand force. Since the hands are the driving force, a tang type handle is considered adequate.

b. Butt Chisel - These types of chisels may be found with blades ranging from 2-3/4" to 3". They are selected for rough and heavy cutting. Short blade chisels may be used in places inaccessible to long blade chisels. The handle of this chisel is made of plastic with some type of metal head.

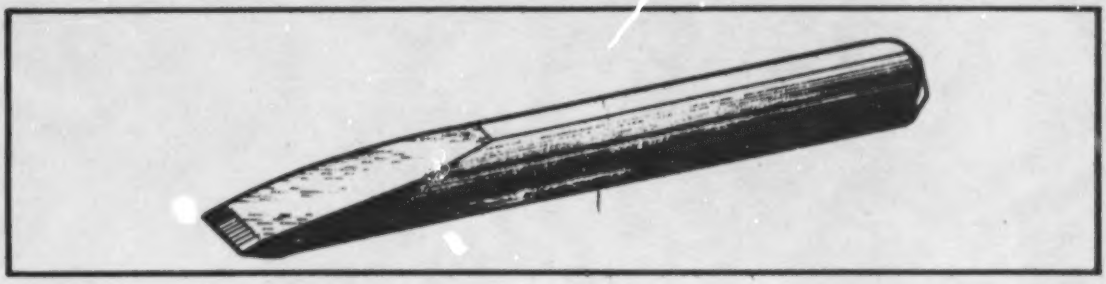
c. Firmer Chisel - Firmer chisels usually have socket type handles. The blades are longer and thicker than the paring chisel blades. They may be used for either light or heavy work. The driving tool for this type of chisel is a mallet. It is not considered the best chisel for paring.

d. Mortise Chisel - Mortise chisels have thick and strong blades. It is used in making mortise joints. When cutting the joint the chisel may be used as a lever to force out chips. The handle is medium to heavy-duty; therefore, a mallet can be used as a driving tool. The blades of these chisels are usually long.

Parts of a Beveled Edge Tang Type Wood Chisel

Chisels for Cutting Metal

Before leaving the subject of chisels, perhaps we should mention one last type - the cold chisel. Although not generally thought of as a tool for carpenters, most of them have one. A cold chisel is made of solid steel and designed for use with a steel hammer. They range in widths from 1/4 to 1-1/4 inches and in lengths from 5 to 18 inches. Carpenters use them to cut nails and sheet iron and to make dovetail anchor slots.



Student_____

Class_____

KNOW YOUR TOOLS

Planes and Chisels

Multiple Choice: Place the letter in front of your choice of the phrase that best completes the sentence in the blank on the right.

1. The plane you would most likely find in the carpenter's tool box would be a: ____

   a. jack plane.
   b. smoothing plane.
   c. block plane.
   d. jointer plane.

2. The first planes were mostly made of: ____

   a. steel.
   b. plastic.
   c. wood.
   d. iron.

3. Planes range in size from: ____

   a. 2 to 12 inches.
   b. 6 to 18 inches.
   c. 4 to 24 inches.
   d. 8 to 36 inches.

4. The plane used for cutting end grain is the: ____

   a. jack plane.
   b. smoothing plane.
   c. block plane.
   d. fore plane.

5. Longest of the planes, the one usually used in bench work, is the: ____

   a. fore plane.
   b. jointer plane.
   c. smoothing plane.
   d. block plane.

6. Chisels with very long blades are called: ____

   a. tang chisels.
   b. socket chisels.
   c. pocket chisels.
   d. firmer chisels.

7. The blade that most closely resembles a file in its shape would be in a: ____

   a. socket chisel.
   b. tang chisel.
   c. heavy-duty chisel.
   d. butt chisel.

8. A chisel designed to both cut and pry is a: ____

   a. firmer chisel.
   b. pocket chisel.
   c. paring chisel.
   d. mortise chisel.

9. One should not use a mallet on a: ____

   a. flooring chisel.
   b. cold chisel.
   c. paring chisel.
   d. 3" chisel.

10. The only chisel designed for cutting metal is a: ____

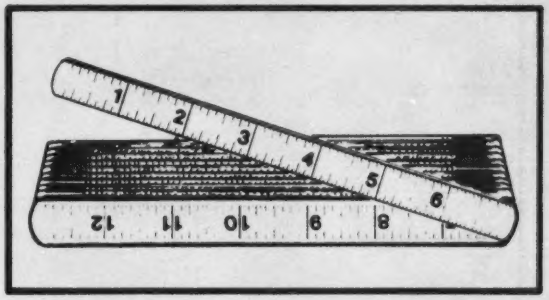
    a. cold chisel.
    b. heavy duty chisel.
    c. socket chisel.
    d. reinforced chisel.

MEASURING AND LAYOUT TOOLS

The skills of a carpenter are primarily reflected by the accuracy with which a job is measured and laid out. And, although this depends largely on experience and the knowledge of "how to", it is also a function of the tools used to do the work. They must be handled with great care and kept in good working condition if a high level of accuracy is to be attained.

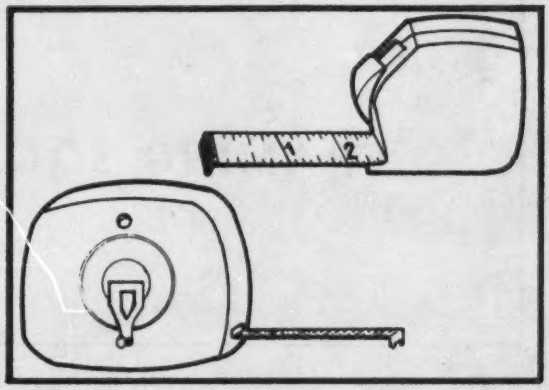
Folding Ruler

The measuring tool used most often by carpenters is the folding wood ruler. Most carpenters carry one in their pockets while on the job. The ruler is 6 feet long and a half-inch wide. Putting a drop of light machine oil in each joint will make them work smoother and will extend the life of the ruler. This tool is often referred to as a zig-zag ruler.



Steel Tapes

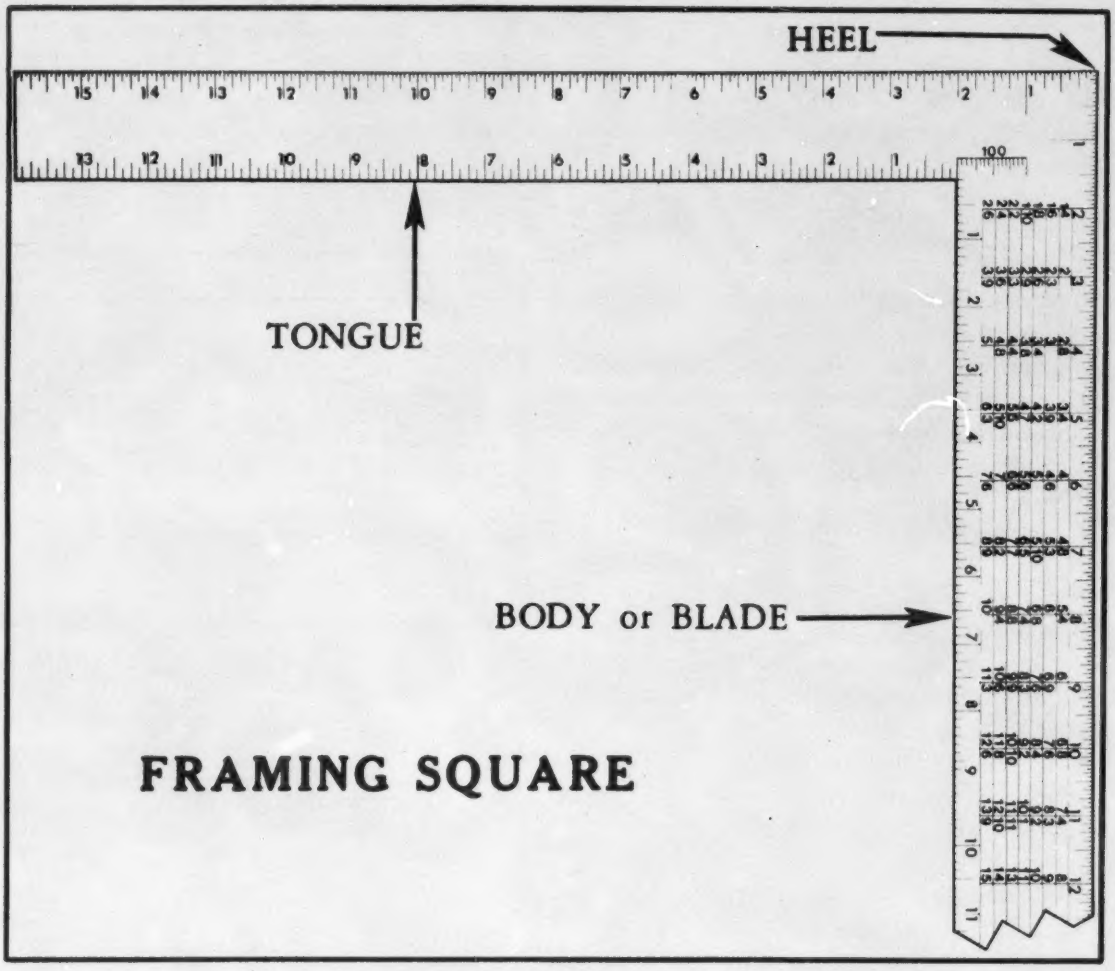
These are very handy rules for quick measuring. Most common are the 6 or 12 foot sizes that are spring loaded for easy take-up. However, they also come in 50 and 100 foot lengths for layout work. These longer ones have side handles for reeling up the tape. Steel tapes should be handled carefully to avoid bending or "kinking". They should be wiped clean and oiled very sparingly. Oil tends to collect dirt which can damage the markings and "gum up" the action of the ruler.



Squares

Almost as important to the carpenter as a saw or hammer, the framing square finds its greatest use in laying out and framing buildings. It is used in spacing studs, framing doors and windows, laying out stringers and carriages in stair construction, and has tables of all pitches for rafter construction. The framing square has, in fact, so many uses that there have been entire books written about it. With a framing square a knowledgeable carpenter can figure board feet of lumber, lay out an octagon, reduce or enlarge sizes without losing relationship of dimensions, and lay out angles for miter and butt joints. It can be used to find either the center or the circumference of circles, lay out the arcs for a circular stairway, and even figure

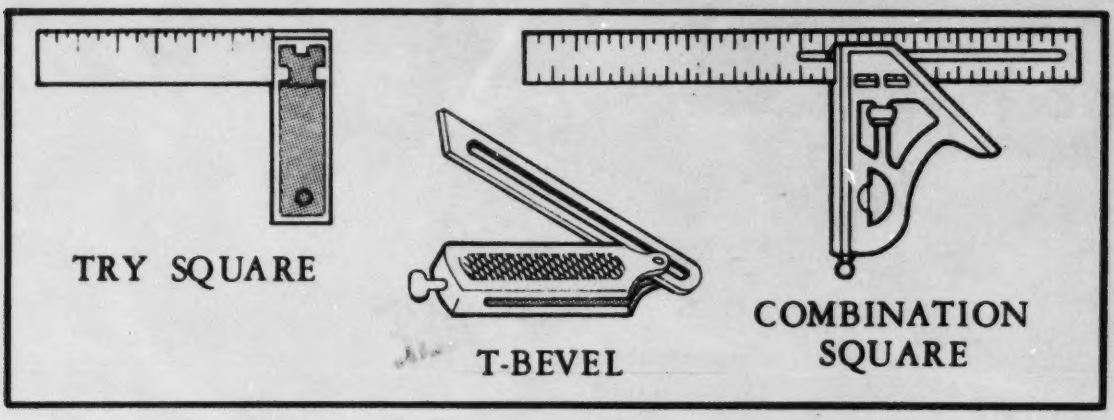
the capacity of a pipe needed to carry the load from two or more other pipes.



Other names for this versatile tool are steel square, rafter square, and carpenters' square. An instruction book usually comes with it which explains the various scales and tables and how to use them. A standard framing square has a body or blade that is 24 inches long and 2 inches wide. At a 90 degree angle to the blade, the tongue is 16 inches long and 1 1/2 inches wide. This tool should be wiped clean after each day's use.

Try squares can be bought with blades either 6 or 12 inches long, and with handles made of wood or metal. This tool is used to check edges and surfaces for squareness and to lay out perpendicular lines. A combination square is similar but more versatile. Its adjustable blade can be set at either 90 or 45 degrees and the handle often has a small spirit level built in. A T-bevel also has an adjustable blade and is

useful for transferring specific angles from one piece of work to another. Laying out cuts for hip and valley rafters is made easier and faster with this tool.

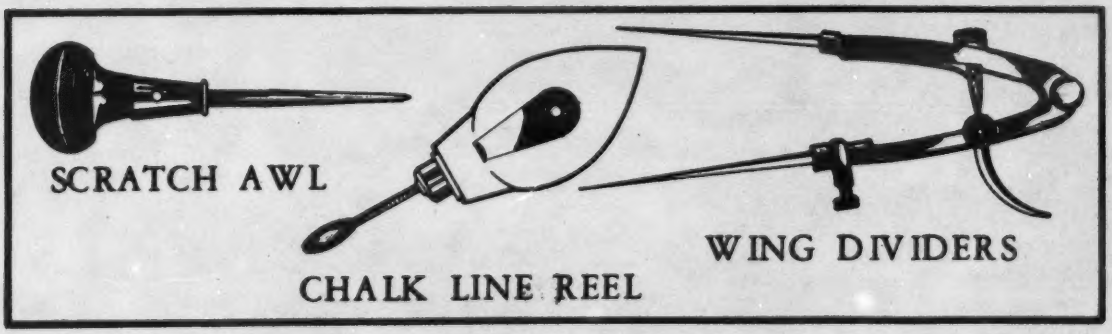


Leveling and Marking Tools

Tools for laying out and checking vertical and horizontal lines are the carpenters' level and plumb bob. The level is usually 24 inches in length, but some carpenters prefer to use one 4 to 6 feet long. With longer levels they do not need a straight edge (long straight board) to check longer spans. This device may be made of wood, aluminum, or lightweight alloys. A plumb bob is used to find a point exactly vertical to a given point overhead. It is used in both layout and for checking work in progress. The size of a plumb bob can range from 4 to 6 inches in length and weigh from 2 3/4 to 16 ounces.

A long straight line between two points can be made most easily and accurately with a chalk line. The chalk covered string is stretched tightly near the surface to be marked, picked up near the middle, then allowed to snap back into place. This action knocks the chalk off the string onto the surface to be marked. The line is re-chalked as it is reeled in.

Wing dividers with a lock to keep the legs in position have several uses. Dimensions can be stepped off or transferred to other positions in layout work. They can also be used to scribe arcs and circles. Another tool for marking materials in layout work is the scratch awl. This is also a handy device for making starter holes for small screws and nails. Still another marking device is the butt gauge used to lay out hinges on doors and door jams. The marking knives are adjustable and the tool should be kept clean and lightly oiled.



Student_____

Class_____

KNOW YOUR TOOLS

Measuring and Layout Tools

Fill in the Blanks: Read each statement carefully. Select a word or words which will complete the statement correctly. Place your answer in the blank space to the right of each statement.

1. Another name for the folding wood ruler is _____ ruler. _____
2. Six and 12 foot steel tapes are usually _____ loaded. _____
3. Longer steel tapes are used for _____ work. _____
4. The most versatile carpenters' tool is a _____ square. _____
5. The unit of measure for lumber is _____ feet. _____
6. The largest part of a framing square is the _____ . _____
7. The narrowest part of a framing square is the _____ . _____
8. Cuts for hip and valley rafters are most often laid out with a _____ . _____
9. The square with a level in its handle is a _____ square. _____
10. The square having a fixed or non-adjustable handle is a _____ square. _____
11. A tool that works by pointing straight down is the _____ . _____
12. For a straight edge, carpenters often use a long straight _____ . _____
13. For making a very long straight mark the carpenter would probably use a _____ . _____
14. "Stepping off" lines is usually done with _____ . _____
15. Door hinges are laid out with a _____ . _____

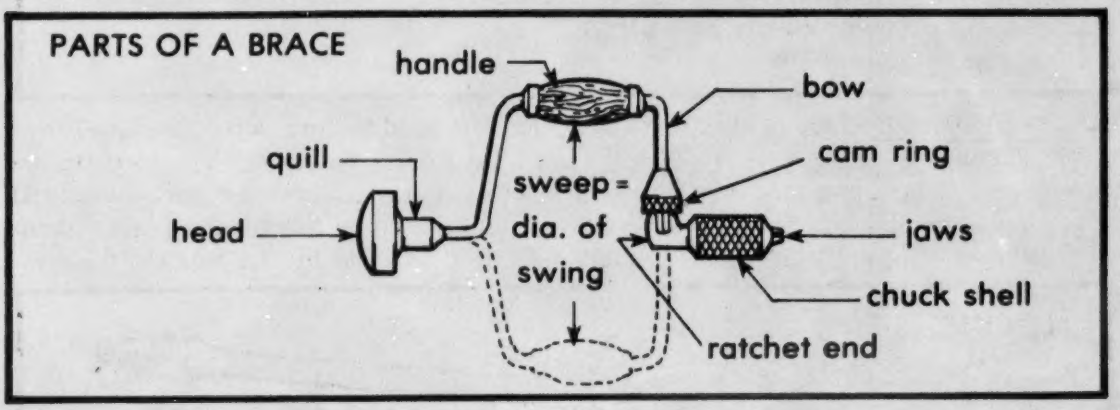
TOOLS FOR BORING

Most experienced carpenters would not feel prepared for a job until their tool boxes are equipped with several different kinds of boring tools. The most common hand tools are the bit brace, hand drill, automatic (push) drill, and breast drill. Different types of corner bit braces are found in some of their kits. The general purposes of these tools with inserted drills and bits are to make holes for bolts, rods, screws, tubing, pipe; make countersinks for screws and bolts; start holes for sawing; and aid in making wood joints.

Bit Braces

The most commonly used brace is the ratchet type. The ordinary brace without the ratchet may cost less than the ratchet brace, but its functions are limited. The ratchet permits the boring of holes in places where a full handle turn cannot be made due to obstructing objects. The ratchet works both ways, forcing the bit forward or backward. It can also be set so that the handle will not swing free in the operation. Corner braces are equipped with two handles and a head. These types of bit braces are used for boring against walls and in corners.

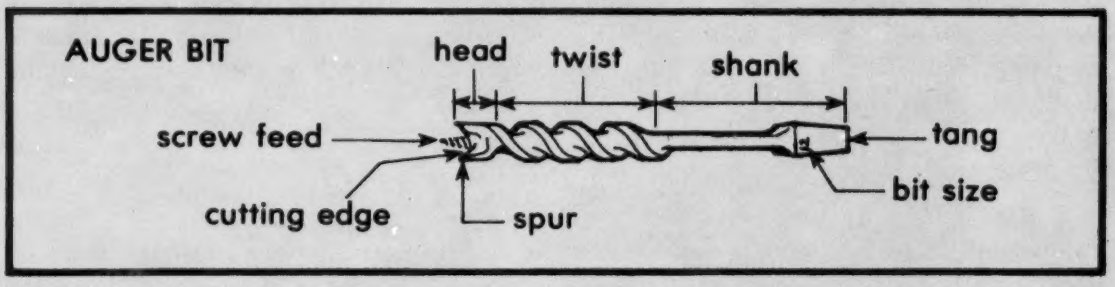
Braces range in size from about 6 to 14 inches. The size is determined by the brace swing or sweep; that is, the distance across the diameter of the circle made by a complete sweep of the handle. A 10-inch sweep brace is most commonly used to do general work. Actually, a sweep equals one-half a circle made by the handle. The jaws fit inside the chuck shell and clamp to the bit tang to hold it firmly in place.



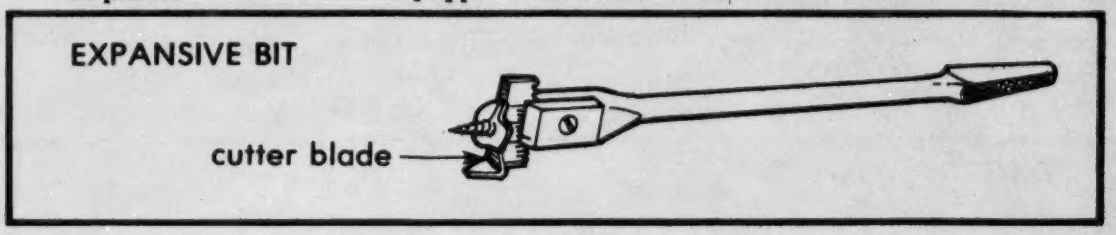
Commonly Used Types of Bits

a. The auger bit is used for boring holes in wood. The tang on the shank is usually square, depending on the type of brace used. Auger bits range in size from 3/16 inch to about 2 inches. A No. 11 bit will bore a hole 11/16 inch in diameter. The figure 11 is found on the shank. Auger bits are usually found in sizes from 1/4 inch up to 1 inch. They may, however, be as large as 2 inches. The three auger bit lengths are as follows. The short (dowel) bit is about 5" in length, the medium length bit is about 8 inches in length, and the long (ship) bit varies from 18 to 24 inches in length. Medium length bits are selected for general wood work. There are also three styles of auger bits. The solid twist center style is

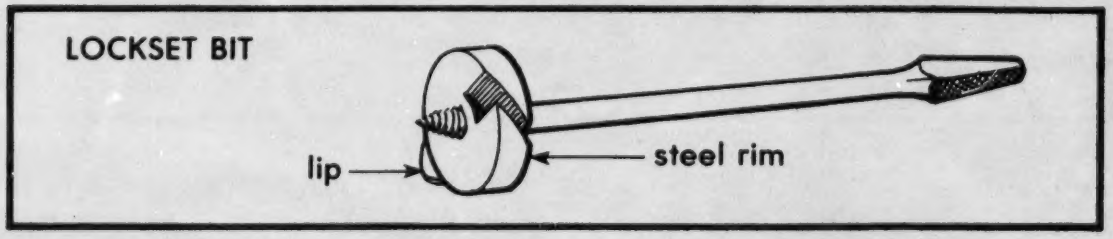
most commonly used because it is considered stronger than the single-twist or double-twist styles. Single-twist bits may be found in long lengths. The double-twist bit is used for dowel boring. This bit bores an accurate smooth hole. The parts of an auger bit are the same on the three types, but these parts vary in shape instead of function.



b. The expansive bit is used to bore holes ranging from 1 to 3 inches in diameter. The blade or cutter may be adjusted for different sizes of holes. The expansive bit is similar to the auger bit in that it has a feed screw that draws the bit into the wood. It has only one lip; therefore, it must be held straight. The cutting blade is adjusted by loosening and tightening the screw that holds the cutter blade in place. Some bits are equipped with a microdial.



c. The lockset bit is also used on wood. It can be used to bore holes for dowel pins and countersinking washers that are used with bolts on wood. The sizes range from 1/4 inch to 2 inches in diameter. The bit has no spur or screw that will pierce the opposite side of the board. It can be used on thin or end grain without the danger of splitting the materials. Cutting is done by the lips on the rim.



d. Brace drill bits are sometimes referred to as twist drill bits with a square tang on the upper end of the shank. One type of these twist drills is for drilling wood and the other type for drilling metal. The more pointed bit stock or twist drill is used for wood only. The point is ground to 60 degrees. Sizes of wood - boring drills range from 1/8 to 1/2 inch. The 1/32 graduation figure is imprinted on

the tang. Metal twist drills range from 1/16 to 5/8 inch, and the increments are 1/64 inch.

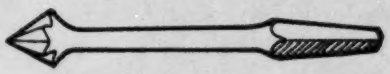
BRACE DRILL BITS

e. Gimlet bits are used to make holes for screws in wood. The bit point and shape form the tapered hole for a screw. If the bit completely penetrates the wood to the shank, the hole will not be tapered. Bit sizes vary from 1/8 inch to 3/8 inch in thirty-seconds.

GIMLET BIT

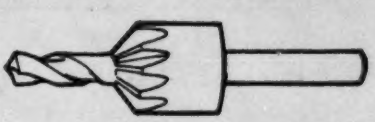
f. Countersinks are used to widen the space at the hole entrance for oval or flat head bolts or screws. The head of the bolt or screw is set flush or slightly below the surface when a countersink is used. The size of the countersink area is determined by the diameter of the cut made by the largest part of the bit. Rose head countersinks are most popular for shaping the tops of holes. Countersinks are used after the hole is drilled; therefore, they are not considered a drill type of bit. There are three different types of these drills. Of the two that are not illustrated, one makes a smooth cut and the other can be used to make a large rough cut.

ROSE HEAD
COUNTERSINK BIT



The combination drill and countersink is used to drill holes and countersink screws in one operation. These bits are calibrated in various sizes. For example, a size 1-1/2 x No. 10 is used to install a screw 1-1/2 inches long and No. 10 body size.

COMBINATION DRILL
AND COUNTERSINK BIT

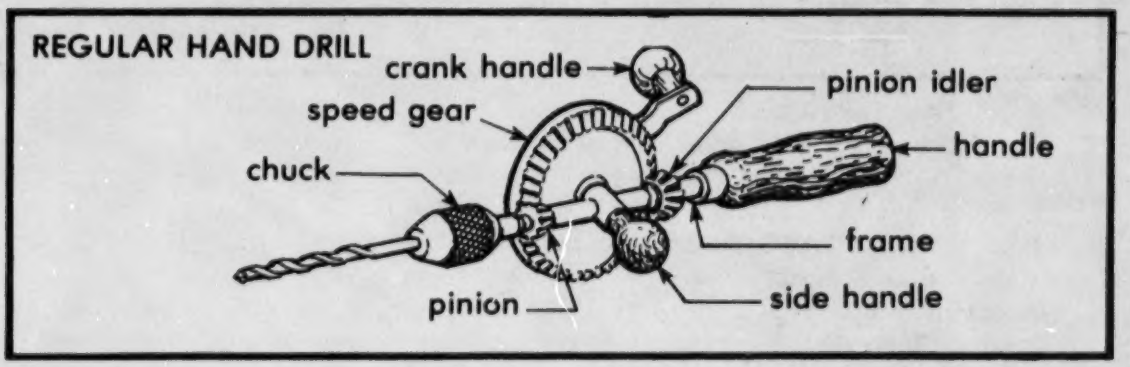


Pipe reamers resemble countersinks except they are more pointed. They have a bit-stock shank so they can be used with braces to ream burrs from inside pipe. Sizes range from 1/4 to 2 inches.

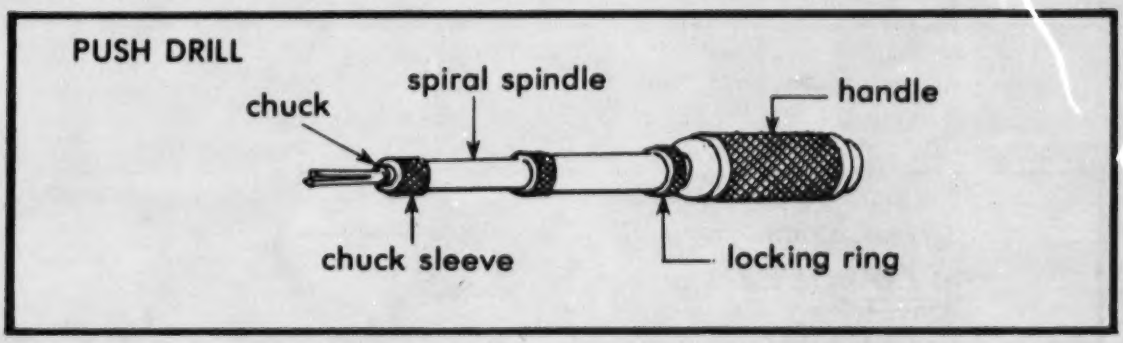
g. Screwdriver bits are used to set or loosen screws and bolts with slotted or phillips heads. Tips of regular bits range from 3/16 to 1/2 inch, and points of phillips bits are found in numbers 1, 2, and 3. The bit numbers range from 4 to 16 and even smaller.

Hand Operated Drills

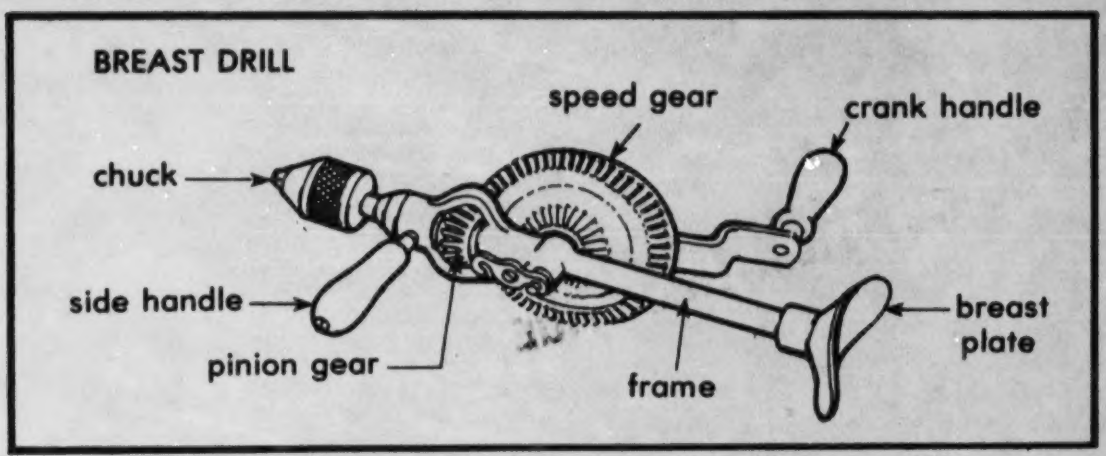
Regular Hand Drill - The regular operated hand drill is designed for drilling holes 1/4 inch or less in wood or metal. However, drills up to 3/8 inch are available. This drill is operated by turning a crank which is attached to a speed gear meshed to the chuck by pinion gears. Both straight shank twist drills and automatic drill bits can be used in this hand drill. The major parts of this hand drill are:



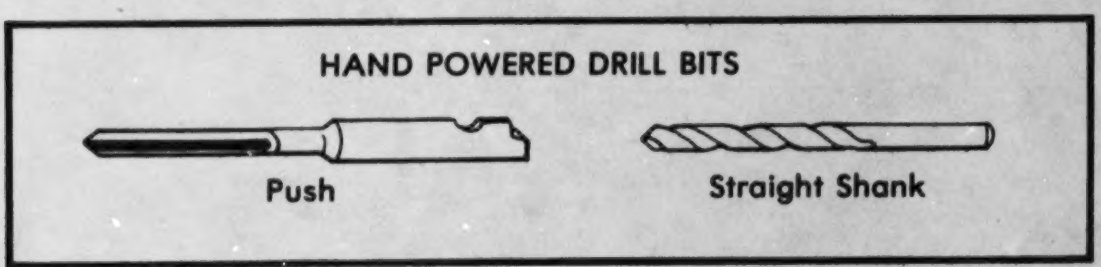
Push Drills - Push drills are used mainly to bore holes for small screws in wood and other soft materials. A push drill is made to bore a hole less than 1/4 inch in size. Most push drills have a set of bits ranging from 1/16 to 11/16 in size stored in the handle. This drill may be operated by one hand while the other hand is left free to support the work. The main parts of this drill include:



Breast Drills - Breast drills are designed for heavier work than either hand or push drills. They are usually constructed with adjustable handles. The drill is made to bore a hole up to 1/2 inch. The breast drill is for general purpose work in metal and wood. The chest or shoulder can be used to apply pressure while drilling. This type of drill usually has two gear ratios. The slower speed is used for heavy drilling. Straight-shank twist drills are used with all breast drills.



Hand Powered Drill Bits - Hand operated drills accept bits with round shanks. They are found in sizes measured by 1/64 inch units. The twist drills are used for both metal and wood. The push or automatic drill is used for wood and other soft materials. Push drill points (bits) range in size from about 1/16 to 11/64 inch.



Student_____

Class_____

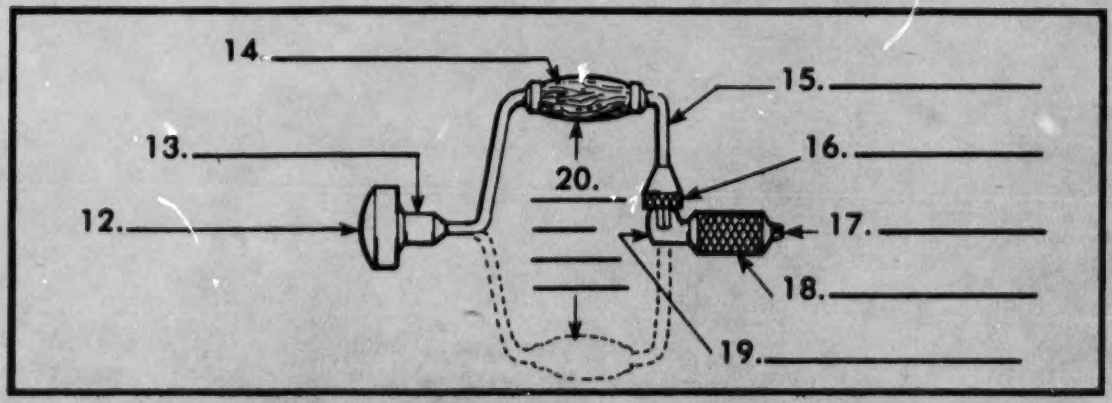
KNOW YOUR TOOLS

TOOLS FOR BORING

Fill in the Blanks: Read each statement carefully. Select a word or words which will complete the statement correctly. Place your answer in the blank space to the right of each statement.

1. Most carpenters use the _____ brace. _____
2. Brace size is determined by its _____ . _____
3. Jaws of a brace are located inside the chuck_____ . _____
4. The tang of most auger bits is _____ in shape. _____
5. A dowel auger bit is about _____ inches long. _____
6. An auger bit 24 inches long is called a _____ bit. _____
7. If a bit has a microdial it is an _____ bit. _____
8. A lockset should be used if there is danger of _____ the wood. _____
9. The bit designed especially for boring tapered holes for screws is a _____ bit. _____
10. Burrs on the inside of pipe are removed with a pipe _____ . _____
11. Screwdriver bits are either regular or _____ . _____

Name the parts of the brace.

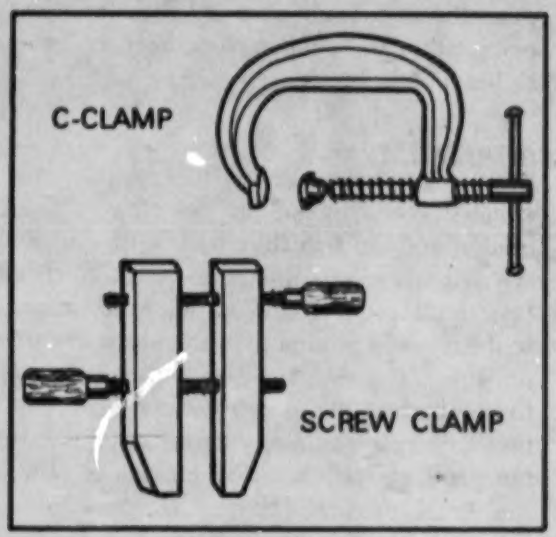


SUPPLEMENTARY TOOLS

The following is a list of tools that do not really fit into any of the categories in previous lessons. Some of them are not generally thought of as tools of the carpenter. However, while some of them might be nice to have because they make a particular job easier, others are absolutely necessary to complete a job.

Clamps

Clamps are used to hold two or more parts together so they can be aligned and fixed in place with metal fasteners or until an adhesive sets. There are many types available, but the two most popular for carpentry work are the C - clamp and the parallel or screw clamp. Due to their being less bulky, C - clamps are the kind usually found in a finish carpenter's tool box. They range in size from a maximum opening of 1 inch up to 12 inches. Screw clamps are bulky and are most often found in a carpentry shop. They have the advantage of having broad jaws with less risk of leaving a mark on the finished piece.

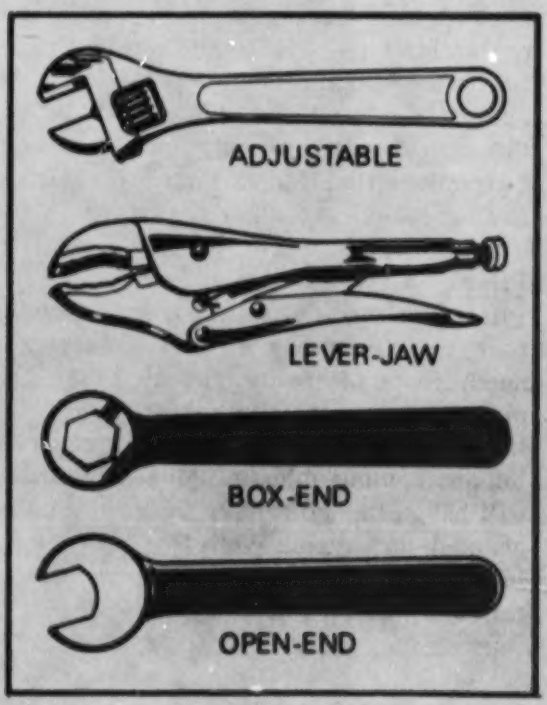


Wrenches

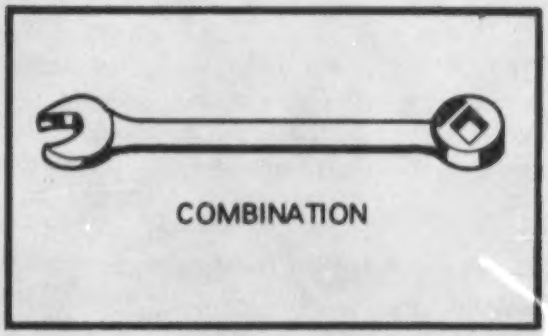
Wrenches are used by the carpenter to turn nuts and bolts in construction and to take apart other tools for cleaning or repair. The most common wrench is one that has an adjustable jaw. They range in size from a few inches in length to a foot long and larger.

Another popular adjustable wrench useful in carpentry has a lever that locks the lower jaw in place. It can be used to grip pieces together as with a vise. Also, both jaws are "toothed", making it adaptable to work with small pipe as well as nuts and bolts. When using an adjustable wrench the turning direction should be toward the weaker adjustable jaw. This reduces the chance of it slipping.

A set of box-end, open-end, or combination wrenches is a handy item for the tool box. An open-end encloses a nut 3/4 of

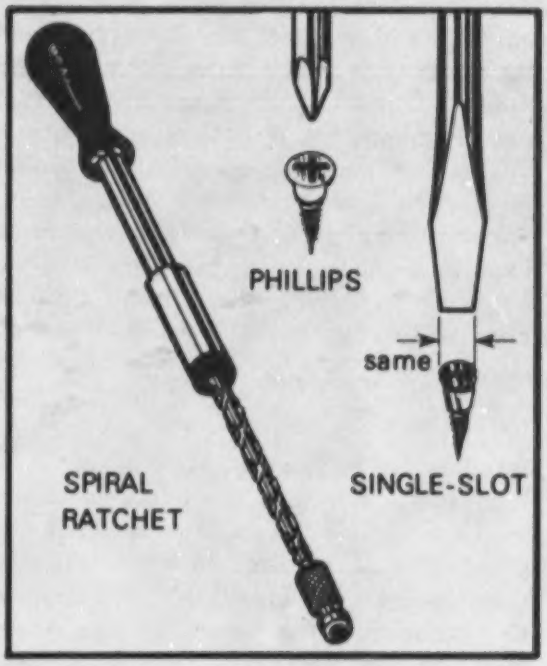


its circumference while a box-end completely encircles or "boxes" the nut in. The latter is less likely to slip, but also requires more room to work above the nut. Combination wrenches have a "box" and an "open" on opposite ends. The ends usually fit the same size nut. A good practice is to snug up a nut with the open-end so that the chance of skinned knuckles is lessened.



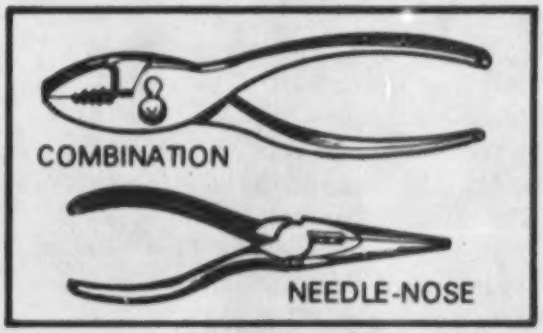
Screwdrivers

There are about a dozen different types of screwdrivers based on the tips of their blades and the way they fit into the screw. We will limit our discussion here to those two most often found in the carpenter's tool kit - the common single-slot and the phillips cross-slot. An important thing to remember about screwdrivers is that they are made in many tip sizes, and that the proper size should be chosen to match the head of the screw. Using one too large can damage the surrounding material. Using one too small can damage the screwdriver, screw head, or both. One particular type of this tool we might mention is the spiral ratchet screwdriver. Its operation is similar to the push drill, but the chuck turns in only one direction. Carpenters find this tool handy for putting in door hinges and other hardware.



Pliers

Pliers are made in many sizes and styles to do specific types of work. There are needle-nose pliers for reaching into tight places, diagonals or side-cutters for cutting wire, and slip-joint pliers for grasping and holding objects. Most carpenters will have pliers of either the slip-joint or channel-lock type. While it is not a good idea to use pliers instead of wrenches, this tool still has many uses.



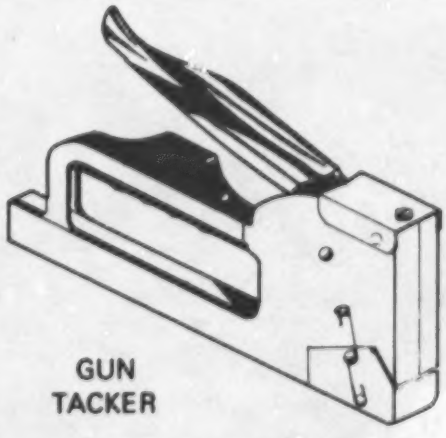
Hacksaws

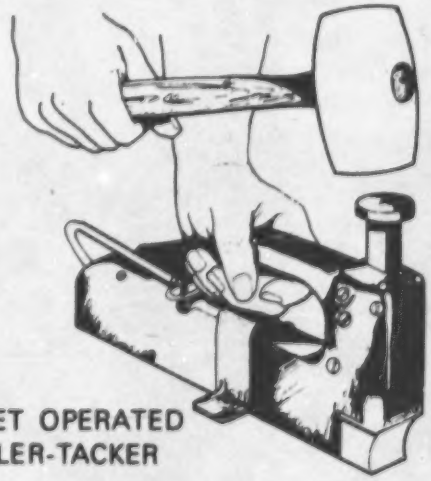
Hacksaws are saws especially designed for cutting metal. The metal frame is adjustable for various blade lengths and a wing nut on the handle end is used to tighten the blade. The teeth cut only on the forward stroke so pressure should be released on the return stroke. This reduces dulling or stripping the teeth. Hacksaw blades are made with teeth of different sizes. This is determined by the number of teeth per inch. Sizes range from 14 to 32 teeth and is referred to as pitch. It has been found that some materials cut better with a hacksaw blade with fewer teeth and others cut better with a blade with more teeth. Machine steel and cold-rolled steel are best cut with a 14-pitch blade. Aluminum and cast iron are cut with an 18-pitch blade, and conduit as well as thin sheet metal with a 32-pitch blade.

HACKSAW

Other tools a carpenter will have are files and an oilstone for sharpening tools with cutting edges, nail sets for driving finish nails below surfaces, a putty knife for filling in cracks and nail holes, and a utility knife for the dozens of uses it is good for.

Some relatively new carpenters' tools are the mechanical tacking, stapling, and nailing devices. Some of them are spring loaded and can be used with one hand. Others are classed as heavy duty and are designed to be used by striking with a mallet. These are very efficient tools for putting up roofing materials, insulation, ceiling tile, etc.


GUN TACKER


MALLET OPERATED NAILER-TACKER

Other items that should be in every carpenter's tool kit are safety and first aid equipment. Goggles or safety glasses should be worn in situations where there is even a remote danger to the eyes. Hard hats should be worn in areas of possible falling objects. A small container of antiseptic to apply to minor cuts and abrasions will reduce the danger of infection. Sterile compresses, gauze, and an assortment of adhesive bandages will reduce bleeding and also the possibility of infection. Also, one should have a container of salt tablets and take them as needed. This will reduce the risk of heat exhaustion.

Student_____

Class_____

KNOW YOUR TOOLS

SUPPLEMENTARY TOOLS

Fill in the Blanks: Read each statement carefully. Select a word or words which will complete the statement correctly. Place your answer in the blank space to the right of each statement.

1. C-clamps range in opening size up to _____ inches. _____
2. C-clamps are usually used on the job because they are less _____ . _____
3. Screw clamps have the advantage of having broad _____ . _____
4. Pliers for working in close places are _____ pliers. _____
5. The number of teeth per inch on a hacksaw blade is referred to as _____ . _____
6. Side-cutters are tools for cutting _____ . _____
7. It is best to cut conduit with a _____ pitch blade. _____
8. Finish nails are driven below the surface with a _____ _____ . _____
9. A cross-slot screw is driven with a _____ screw-driver. _____
10. Box-end wrenches are less likely to _____ than open-end wrenches. _____
11. The blade of a hacksaw is tightened by turning a _____ _____ . _____
12. Hacksaws are designed to cut _____ . _____
13. Cutting tools are sharpened with a file and a/an _____ . _____
14. If a mechanical nailer is used with a mallet it is classed _____ _____ . _____
15. Lever-jaw pliers are compared to a vise due to their ability to _____ pieces together. _____